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Infrastructure Regulation

Promises, Perils and Principles

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Executive Summary

For much of the 20th century and in most countries, network utilities—telecommunications, electricity, natural gas, railroads, water supply—were vertically and horizontally integrated state monopolies under ministerial control.[1] Almost universally, infrastructure's economic importance and concerns about monopoly power led governments to conclude that control over these services could not be entrusted to the signals, motivations, and penalties of free markets.

Governments also believed that, given the large investments involved, public resources were required to increase infrastructure coverage. In most cases a single public entity controlled every aspect of a utility—from operations to administration—and determined which services to provide to essentially captive markets.

But this approach often led to extremely weak infrastructure services—especially in developing and transition economies. Common problems included low productivity, high costs, poor quality, chronic revenue shortages and falling investments, long waits for and shortages of services, and nonpayment for and theft of services. Such inefficiencies significantly impeded sustained economic growth and international competitiveness. In the early 1990s, for example, annual losses due to mispricing and technical inefficiency were almost equal to annual investments in infrastructure in developing countries (figure 1). With growing budget deficits and the resulting inability of governments to maintain and expand infrastructure services, most countries simply could not continue to maintain state-owned utilities.

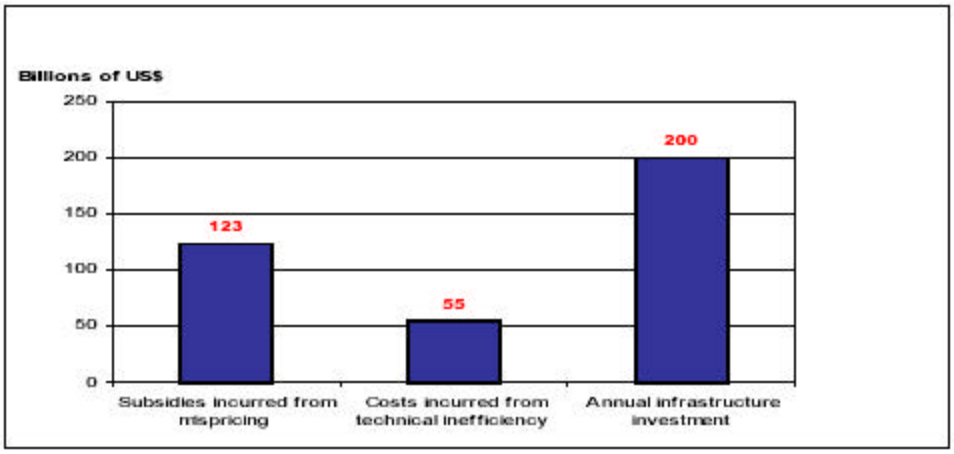
Recent Decades Have Seen a New Model for Financing and Providing Infrastructure

As a result of these problems, public policies toward infrastructure have undergone profound changes over the past two decades. Nearly all industrial and many developing countries have implemented far-reaching structural reforms of utilities—including privatization of many services. The new economic framework entails:

- Reorganizing state-owned utilities into autonomous enterprises that run on commercial principles and are largely free from ministerial control.
- Unbundling structurally competitive or contestable activities from natural monopolies.
- Removing statutory restrictions on entry into the potentially competitive segments.
- Privatizing some or all assets, especially in the competitive elements.
- Establishing institutional mechanisms to regulate activities where competition is not feasible.

[1] This refers mainly to the period after World War II. Private ownership in electricity was initially the norm in many countries in Europe and North and South America. State ownership spread later, especially after World War II, either for ideological reasons (as in England and France) or because political constraints on prices forced private firms into bankruptcy (as in Latin America). Similar situations prevailed for railroads, trucking, and water in many countries. Telephone services became captive of state-owned post offices in Europe and Japan, but not in Canada, the United States, or, initially, Latin America.

Figure 1 In the early 1990s developing countries lost nearly as much to infrastructure mispricing and inefficiency as they invested in infrastructure each year



Note: Estimates of mispricing subsidies and technical inefficiency costs cover water, railroads, roads, and power.
Source: World Bank 1994.

But for privatization and related infrastructure reforms to succeed over the long term, they must be accompanied by well-designed market and governance structures. Achieving the public interest goals of privatization requires a microeconomic structure open to competition. Few—if any—sustainable improvements in utility performance can be achieved simply by replacing a state-owned monopoly with a private one.

Regulatory features are also extremely important for performance. In general, performance is better when regulatory agencies are free of political influence and their decisions are subject to review by the judiciary or another nonpolitical entity. In addition, regulatory processes should be open and transparent, and policies should facilitate and encourage competition—while ensuring minimal interference with economic efficiency. Finally, regulation should be designed in advance of privatization.

Most countries—rich and poor—share common objectives for infrastructure, the most important being universal access to affordable, efficient, safe, reliable services produced and delivered in environmentally responsible ways. So, many of the regulatory principles that have emerged in industrial countries should be applicable in developing and transition economies.

But developing and transition economies also have socioeconomic features that must be taken into account when designing new regulatory policies. For example, major price increases and tariff rebalancing are likely to be more disruptive in poor countries—and may pose enormous burdens. Thus regulation must be sensitive to concerns about affordability. Including consumers—particularly disadvantaged groups—in the regulatory dialogue can help ensure that regulators are sensitive to the need for accessible, affordable services. In addition, experience with privatization especially in the water sector in developing countries has shown that contractual provisions to encourage operators to innovate in providing non-conventional services

may be needed to ensure that services expand rapidly to poor households, both in rural and informal urban settlements.

What Has Been the Record So Far?

Future efforts at privatization and regulatory reform in developing and transition economies will be shaped by their economic and political features as well as by assessments of the record so far—both in those countries and elsewhere. But because the performance of every network utility is multifaceted, it is never susceptible to a definitive evaluation: different observers place emphasis on different aspects of performance.

Assessments of performance are further complicated by the short lifespan of privatization, restructuring, and regulatory reform in most developing and transition economies. In addition, crucial economic variables are subject to severe measurement problems. And because privatization, restructuring, and regulatory reform have generally occurred simultaneously, it is almost impossible to identify their separate effects econometrically. (Only in the United States, where the structure of ownership remained constant, can changes in performance be confidently traced to changes in regulation.)

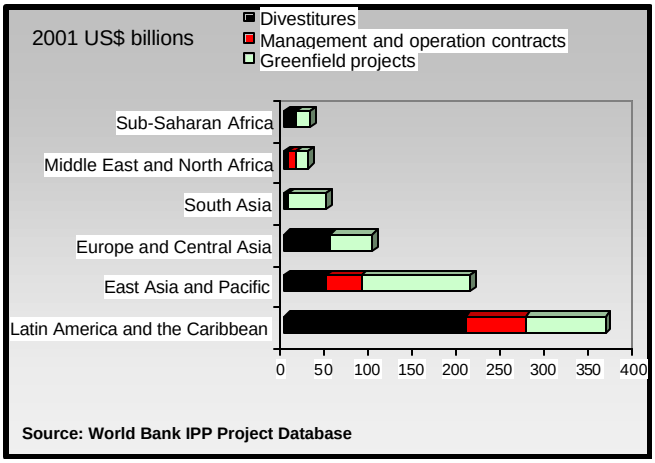
Leaving aside these measurement difficulties, empirical evaluations of privatization and restructuring are largely favorable. While experiences have varied considerably across countries and industries, most infrastructure reforms have improved many aspects of performance. Service quality has improved. Productivity and cost-effectiveness have risen. Investment and service coverage have increased. Prices have become more closely aligned with underlying costs. And services have become more responsive to consumer and business needs and to opportunities for innovation.

Operating efficiency increases considerably when utilities are held to hard budget constraints and relatively free from political interference in their business decisions. Privatized utilities generally exhibit better performance than commercialized ones that remain mostly under public ownership. But the performance differences between these alternative organizational forms are often small in comparison to the improvements that either brings relative to state utilities under ministerial control—especially when competition is encouraged.

This report evaluates the privatization of network utilities in developing and transition economies using three criteria: the resulting levels of investment (and thus service expansion), operating (technical) efficiency, and allocative efficiency (as indicated by the rebalancing of tariffs). But no public policy can be justified on purely economic grounds if a country's population considers its results unacceptably unjust. Thus this report also assesses the distributional consequences of reforms—especially their effects on basic services for poor households and other disadvantaged groups.

Effects on investment and service expansion

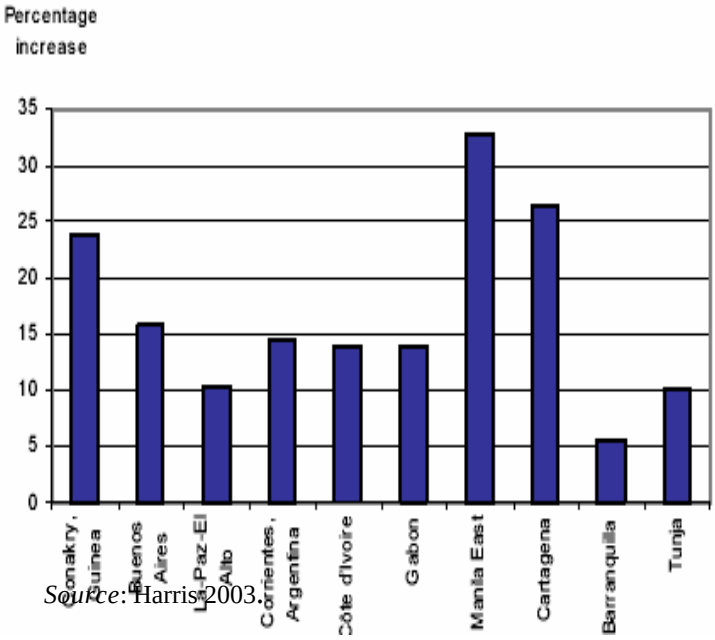
Figure 2 In 1990-2001 Latin America and East Asia received the bulk of private investment in infrastructure



The relaxation of investment constraints on public utilities and the elimination of restrictions on new private entrants have led to impressive increases in investment. Between 1990 and 2001 more than $750 billion was invested in 2,500 private infrastructure projects in developing and transition economies. (Investment dropped after the 1997 East Asian financial crisis, however, and today's investment climate is extremely adverse.)

Such investment varied enormously across regions, with nearly half going to Latin America and the Caribbean (mainly through divestitures) and more than a quarter going to East Asia and the Pacific (mainly in greenfield projects; figure 2). Meanwhile, Sub-Saharan Africa and the Middle East and North Africa each received just 3 percent of private investment—reflecting much weaker reform efforts. Investment also varied considerably by sector, with most going to telecommunications and power.

Figure 3 Privatized services have considerably increased **access to safe water in a variety of cities and countries**

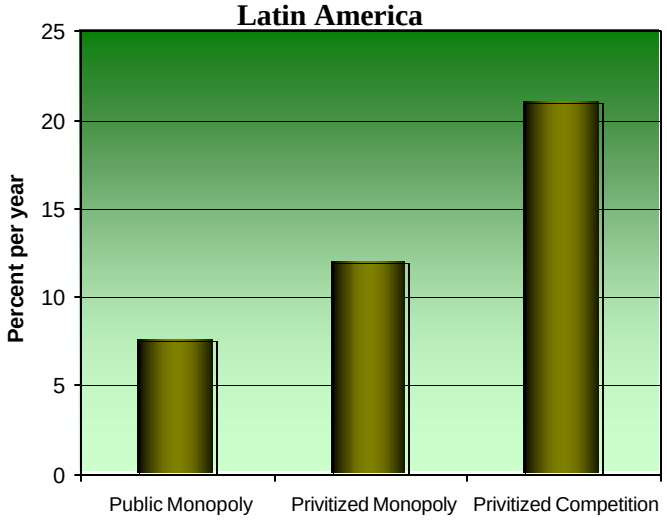


Source: Harris 2003.

By relaxing financial constraints on state utilities and strengthening regulation, reforms have expedited service expansion in a variety of sectors and countries. Telecommunications coverage has seen the largest jump, but significant increases have also occurred in electricity, transportation, and access to safe water (figure 3). The size of such changes depends enormously on the extent to which the market is liberalized and the effectiveness of regulation. For example, increased competition has been particularly powerful in boosting telecommunications coverage. In

Latin American countries that have allowed competition in telecommunications after privatization, networks have expanded almost twice as quickly as in countries that simply converted to private monopolies. But even private monopolies have expanded faster than public ones (figure 4).

Figure 4 In 1989-94 privatization dramatically increased growth in telecommunications lines in Latin America

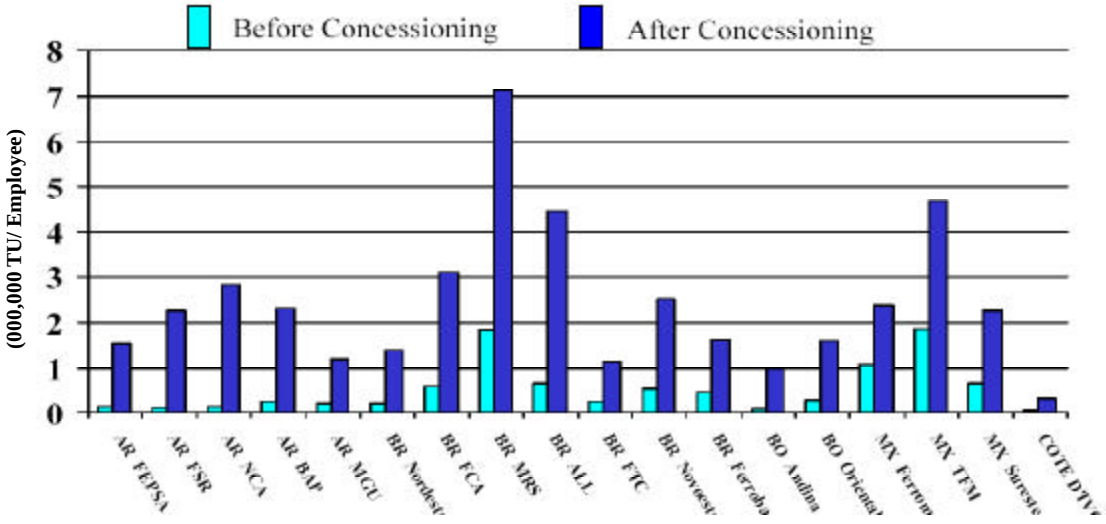


Source: Wellenius 1997.

Effects on operating efficiency

Privatization, restructuring, and deregulation have made network utilities far more efficient in developing and transition economies. Many of these gains resulted from policy options previously denied to state enterprises. As part of their privatization contracts, new operators could generally start shedding excess employees—one of the most vexing problems for state-owned utilities in nearly every developing and transition economy. As a result, reforming countries have often seen dramatic improvements in labor productivity across infrastructure sectors (figure 5).

Figure 5 Railway concessions led to stunning increases in labor productivity **in the 1990s**

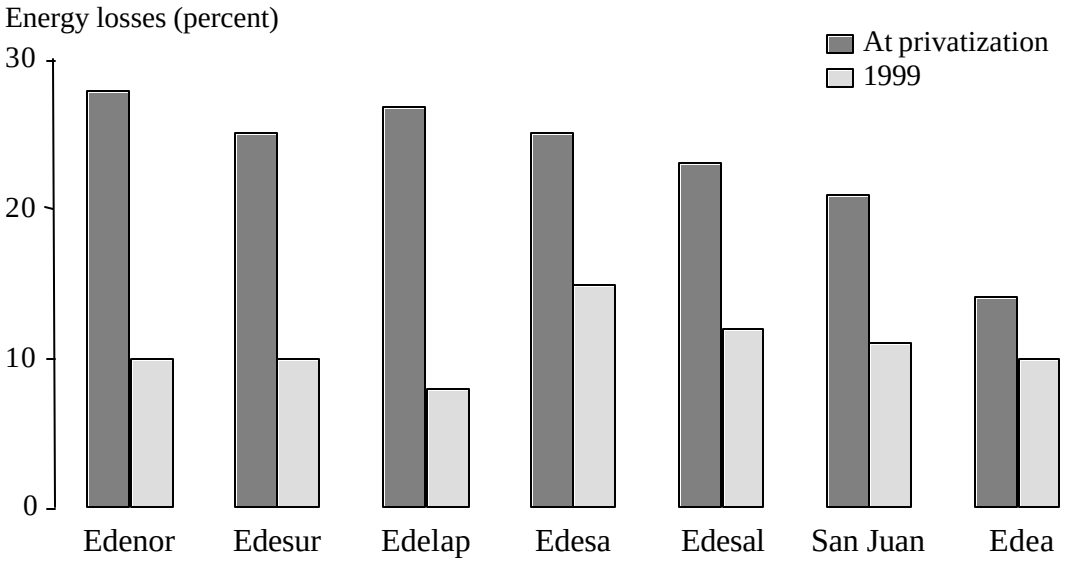


Source: Thompson and Budin 2001.

A key argument for privatization is that, relative to state-owned utilities, private owners and operators have stronger incentives and are better able to control costs, respond to consumer needs, and adopt new technologies and management practices. In many developing and transition economies, privatization and deregulation have significantly improved physical performance, service quality, and other aspects of efficiency. Although the most dramatic gains have been in telecommunications (due to revolutionary technological changes in recent years and the sector's substantial scope for competitive entry), other infrastructure sectors have also made swift advances.

In telecommunications, privatization and related reforms have reduced repair requests and raised call completion rates and the probability of receiving a dial tone. In railroads they have increased locomotive availability. In ports they have shortened waiting times for vessels and increased crane handling rates. And in electricity they have lowered energy losses, outages per customer, and rates of plant unavailability (figure 6).

Figure 6 Argentina's energy distribution losses have been slashed since privatization



Source: Feler 2001.

Effects on allocative efficiency

Before reforms, inefficient pricing was one of the main reasons for the worsening performance of infrastructure services in developing and transition economies. Prices for basic services were held below supply costs, subjecting infrastructure providers to considerable

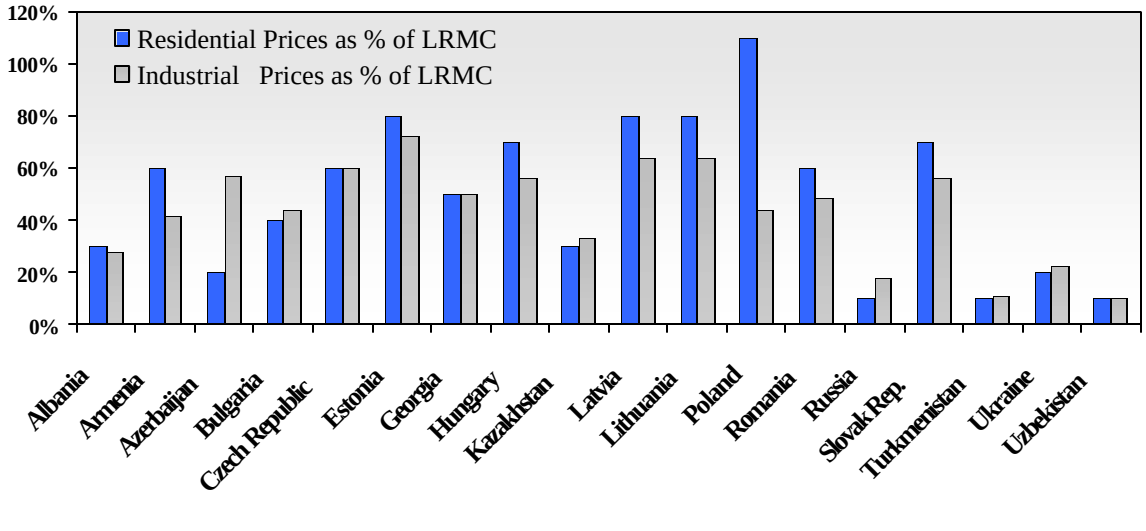
financial distress and substantially impairing their ability to maintain and expand services—particularly to poor households and rural areas. The failure of many governments to adequately increase rates, especially during periods of high inflation, effectively decapitalized their infrastructure systems.

Most developing and transition economies have also used systematic cross-subsidies to control prices. In telecommunications, for example, rates for access and for local calls have been low, while those for domestic and international long-distance calls have been high (relative to underlying long-term costs). Similarly, residential electricity has often been priced below its incremental cost—while service for industrial users has been priced above its standalone cost.

The public rationale for such policies is that they foster desirable social goals (such as helping certain groups of customers who would otherwise be disadvantaged) and positive economic externalities (such as those associated with universal service). But in practice a large portion of such subsidies have flowed to people other than the intended beneficiaries. Furthermore, distorted prices imposed significant costs by sending the wrong economic signals to consumers, suppliers, and investors.

In developing and transition economies one of the main attractions of infrastructure reform is the expectation that it will make price reform a policy priority. The assumption has been that private investors will be unwilling to invest in the sunk assets required to supply infrastructure services unless governments agree to implement tariffs that reflect costs. And indeed, many countries are dismantling long-standing policies of underpricing and cross-subsidies. But in some countries price reform has been very slow, with infrastructure prices still

Figure 7 In 2000, electricity prices covered only a small fraction of long-run marginal costs in many transition economies



far removed from their underlying costs in a highly unbalanced structure. For example, in 2000 household electricity prices still covered less than 50 percent, and industrial prices less than 70 percent, of long-run marginal costs in most transition economies (figure 7).

Effects on distributional equity

In recent years the alleged failures of privatization have led to violent street riots, skeptical press coverage, and mounting criticism of multilateral institutions and international investors. Contributing to this disillusionment have been employee layoffs, price increases, perceived long delays in benefits, and the distributional impacts of privatization.

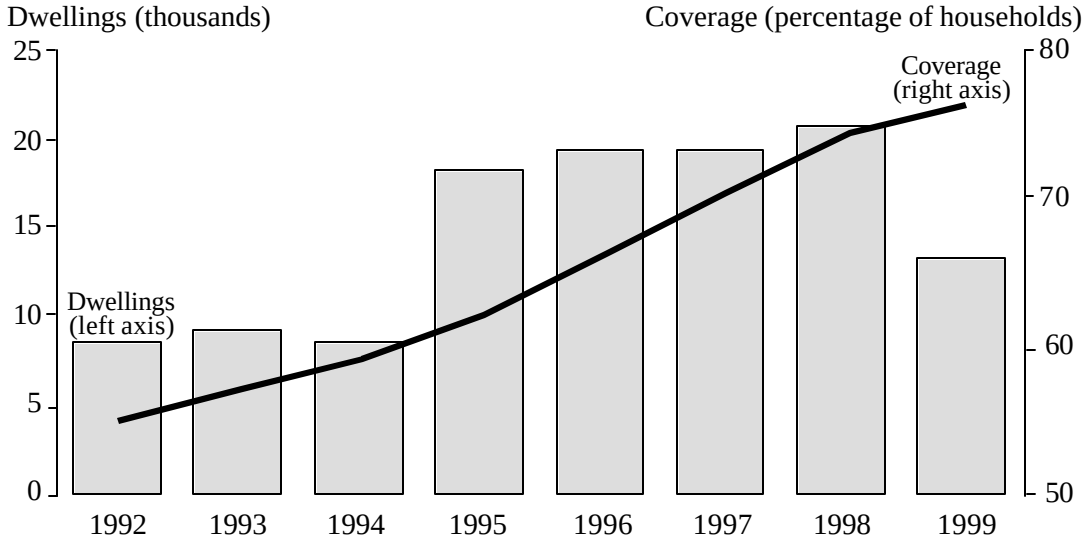
The apparent discrepancy between scholarly assessments and public perceptions of privatization may result from the different yardsticks and time horizons used. Consumers dislike higher prices—even if they result in better services. Similarly, the general public dislikes layoffs—even if agencies were clearly overstaffed. And tariff rebalancing, though usually essential to effective privatization, can hurt poor people.

Thus privatization efforts require more comprehensive assessments of their welfare effects—moving beyond standard analyses of their effects on firm profitability and other elements of industry performance to include their effects on workers and on households at different spending levels. Moreover, distinctions between low- and middle-income countries need to be made more carefully. In low-income countries nearly all rural and many poor urban residents lack access to basic infrastructure services. Thus the policy reforms that normally accompany privatization—such as eliminating cross-subsidies and moving toward tariffs that reflect costs—mainly affect higher-income groups. But in middle-income countries—such as those in Latin America and especially the transition economies—such reforms can hurt poor people because many of them (mainly in urban areas) have access to basic services. The solution is not to halt the needed reforms but to put in place effective safety nets.

Recent empirical work offers important insights on the distributional effects of utility privatization and regulation. It also highlights an important potential pitfall in developing and transition economies: weak regulatory capacity. Studies using computable general equilibrium models have found that in Argentina all income classes benefited from the efficiency, quality, and access improvements resulting from the utility privatizations that began in 1990. More efficient infrastructure services also affect most other economic activities and promote general economic growth—enhancing economic opportunities for poor people. When these general equilibrium effects are taken into account, the poorest groups seem to benefit the most from the increased productivity and access brought about by privatization and related reforms.

Recent research analyzing the welfare effects of utility privatizations in four Latin American countries (Argentina, Bolivia, Mexico, Nicaragua) found no clear pattern in price changes—in about half the cases, prices fell. But there were adverse distributional effects on the bottom half of the income distribution due to job cuts in the privatized utilities. (Though the utilities accounted for only a small share of employment in these countries, so privatization cannot be blamed for any significant increases in national unemployment.) Still, the negative distributional effects of layoffs and price adjustments were more than offset by improvements in service quality, increased access for poor people (figure 8), and the changed structure of public finances, which benefited poor people more.

Figure 8 In Chile privatization significantly increased access to electricity for rural households, 1992–99



Source: Chile National Energy Commission 1999.

Negative popular perceptions of privatization might also reflect a process that has at times been deeply flawed. For privatization to achieve its public interest objectives, significant institutional preconditions must be met. For example, effective regulation is needed to balance the interests of consumers and operators—to protect consumers lacking competitive alternatives while allowing operators to earn a fair return on prudent investments. In some countries where privatization was pushed in the absence of such institutional safeguards, it led to serious problems. Advocates may have overestimated its benefits and underestimated its costs and requirements.

Given the importance of network utilities, removing pricing distortions in these sectors is crucial to any economic reform in developing and transition economies. Still, there are good reasons to avoid overly abrupt, across-the-board price changes. Rapid, substantial price changes can cause large, unnecessary adjustment costs to consumers and firms alike. Even optimal prices, if instituted extremely quickly and without sufficient notice, can lead to a difficult transition process that is far from optimal. This point has been ignored in some privatization and restructuring programs, creating public disenchantment with reforms and a danger of policy reversals. This is not to say that the required realignment of consumer prices and underlying costs should merely be postponed. To the contrary, policymakers should plan from the outset for a smooth, deliberate transition to efficient pricing levels and structures.

The New Model Poses Sizable Risks—But Also Holds Enormous Promise

The global wave of infrastructure privatization and liberalization in the 1990s was a significant departure from previous economic consensus. This departure did more than just question the need for state ownership of infrastructure: it also reconsidered long-standing notions about natural monopolies and related regulatory interventions.

The old utility model assumed that every infrastructure network industry was a natural monopoly in which a single firm could achieve lower costs and provide better services than multiple competing suppliers. But in recent years there has been growing recognition that network utilities are not monolithic natural monopolies. Rather, they encompass distinct activities with entirely different economic characteristics—entailing a mix of structurally competitive (or contestable) and monopoly elements.

Today the public utility concept has been undermined by technological progress (which has proven a potent enemy of natural monopolies), advances in economic thinking, and mounting evidence of the high costs of government intervention. As a result it is widely accepted that the monopoly utility model no longer applies—and perhaps never should have been applied—to all network industries. Moreover, if these industries are properly reorganized and restructured, substantial competition can emerge for many activities.

Yet today's industrial countries relied on the old, vertically integrated model to develop good infrastructure and have only recently pursued the new paradigm of unbundling. So why should developing and transition economies take this approach when the old model worked reasonably well for wealthier countries? This question is especially relevant given that the new model poses considerable risks if not accompanied by policies that harmonize competition with regulation.

The simple answer is that the new model, implemented correctly, offer benefits too big to ignore—for governments, operators, and consumers—especially relative to the status quo. And with the right approach and proper know-how, the new model can be implemented correctly. Still, it should not be pursued without careful attention to the concerns it raises.

Unbundling is difficult to do well…

The new conventional wisdom is that network utilities should be unbundled, with potentially competitive segments under separate ownership from the natural monopoly network:

- In electricity, transmission and distribution should be unbundled from generation.
- In telecommunications, the local loop should be split from long-distance, mobile, and value added services.
- In natural gas, high-pressure transmission and local distribution should be separated from production, supply, and storage.

- In railroads, tracks, signals, and other fixed facilities should be separated from train operations and maintenance.

Under this view, in competitive or contestable segments any interference with market mechanisms should be minimized and privatization and competitive entry should be fully exploited. Only segments where natural monopoly conditions persist and are unavoidable (generally because they involve substantial sunk capital) should be regulated and perhaps operated by the public sector.

The tradeoff between unbundled and vertically integrated organizational forms is that between the potential efficiency gains from competition and the potential loss of coordination and scope economies. Thus the primary virtue of unbundling is that it may foster competition, ensuring efficient selection among firms to provide their services at efficient prices. Unbundling is likely to be particularly attractive when market size and density permit many operators to function, providing both active and potential competition.

But in many developing countries markets might be too small for substantial competition to emerge. In electricity, for example, 60 developing countries have peak system loads below 150 megawatts, another 30 between 150 and 500 megawatts, and possibly another 20 between 500 and 1,000 megawatts. Even a 1,000-megawatt system is small for introducing competition. Thus the benefits of competition that come from unbundling will be limited in many developing and transition economies.

The unbundling of tiny power systems exemplifies the formulaic approach to policy reform pursued by developing and transition economies and their international advisers. Potential economies of vertical integration have often been ignored—creating many problems in restructuring and in introducing competition.

Provision of many innovative, market-responsive utility services may require specific investments in physical infrastructure. In unbundled systems it may be difficult and inefficient for any provider of competitive final services to coordinate, as necessary, with the monopoly infrastructure entity—especially if their incentives for investments are not in harmony. Thus another factor required for unbundling is a mature, well-developed set of fixed network facilities, so that there is little need for new infrastructure investments where incentive problems are more likely. Yet circumstances in most developing and transition economies are exactly the opposite. These countries require substantial new infrastructure investments, either because their networks are underdeveloped or because they have not been adequately maintained or modernized (or both).

…and demands careful regulation

Unbundling can reduce the scope of regulation by isolating monopoly segments, containing their damaging consequences, and replacing regulation with competition in competitive activities. But even though a smaller range of activities requires continued regulatory oversight in unbundled systems, performance becomes much more sensitive to regulatory efficacy. In fact, certain inefficient practices (such as internal cross-subsidies) that were tolerable in a monopoly environment can cause much more damage in the new setting.

Poor regulatory design can have dire consequences, undermining the benefits of restructuring and privatization.

To obtain the benefits of unbundling, policies need to harmonize regulatory oversight of monopoly activities with increasing competition. Otherwise, the interface between bottleneck components (those essential to the provision of final services and too costly to duplicate) and competitive segments can create such severe distortions that the mixed system is the worst of both worlds. Thus unbundling makes the regulatory task more complex, which is likely to be a problem in environments with weak governance—as in most developing and transition economies.

Privatization has been oversold and misunderstood

Just a few years ago, privatization was heralded as the elixir that would—by promoting investment, productivity, and growth—rejuvenate lethargic, wasteful infrastructure industries and revitalize stagnating economies. Today privatization is undergoing many revisions, and its critics are numerous and vocal. Skepticism and outright hostility toward privatization are not limited to a few radical protesters. Opinion polls in several developing and transition economies, especially in Latin America, reveal growing public dissatisfaction with privatization. Disapproval ratings were higher in 2001 than in 2000, and higher in 2000 than in 1998. In 2001 almost 80 percent of Argentines surveyed disapproved of the country's privatization process.[2]

As with all economic elixirs, infrastructure privatization was initially oversimplified and oversold—and ultimately disappointing, delivering less than promised. At the same time, many of its critics are unduly impatient and suffer from some illusion and misunderstanding. Privatization is no panacea, but neither is returning to the old ways.

Most developing and transition economies have suffered from much worse infrastructure performance than have advanced industrial economies. But the structure of ownership has not

[2] The results of such polls, however, can be very sensitive to how the questions are asked. As Klein (2003) notes, according to such polls only 21 percent of Peruvians seemed to generally support electricity privatization. But when asked specifically about privatization implemented transparently and accompanied by increased investments as well as prices set by a regulatory process, more than 60 percent favored privatization.

been the key explanatory variable for the differences in performance. After all, for many years state ownership also prevailed in most advanced economies. The true explanation lies elsewhere.

It can be argued that the performance of state-owned network industries is an accurate summary statistic of a variety of country characteristics both observable and unobservable (institutional endowments, nature of organized interest groups and patterns of social conflict, business culture and codes of conduct, and so on). It would be unrealistic to expect such features to change on a timescale comparable to that of privatization transactions—or to think that less attractive attributes would disappear overnight.

Strong institutions took a long time to develop even in advanced industrial economies. It is difficult to create such institutions overnight in societies that do not have the constitutional, political, and legal traditions required to support them. Thus achieving the public interest objectives of privatization will take longer than has elapsed since such reforms were introduced in most developing and transition economies. Even in East Asia's "miracle" economies it took several decades of concerted efforts to produce notable results.

Public discontent with privatization has been fueled by price increases, job reductions, and the high profits of firms that have improved operating performance. But these adjustments have been necessary for privatization to achieve its public interest objectives. As noted, one of the main problems with the old utility model was underinvestment, largely caused by underpricing. Government subsidies simply perpetuated the problem—until the fiscal crunch occurred. Then the choice became higher taxes or higher prices. Higher prices generally fall on those benefiting from existing services—the middle and upper classes—while higher taxes are likely to hit poor people and other vulnerable groups. Thus a sensible, and arguably less regressive, response is to realign prices with costs. That privatization makes such adjustments mandatory—to attract investors—is one of its main appeals.

As for layoffs, state utilities in most developing and transition economies had high excess employment before reforms. Efficiency and competitiveness require eliminating redundant jobs. Efficiency is especially important in infrastructure because such services are critical for manufacturing, transportation, and commerce—and so essential to boosting economic activity and increasing competition by expanding product lines and geographic distribution.

Moreover, the market's primary incentive mechanism is the prospect of profits for firms that succeed. So, while preventing monopoly profits is a legitimate goal for public policy, it should not lead to artificial limits on post-privatization profits or restrict such profits based on mechanistic formulas or populist demands. Otherwise, incentives for investment, innovation, efficiency, and productive growth—badly needed in the network utilities of most developing and transition economies—would be undermined or eliminated.

One model does not fit all—choosing among imperfect options

One clear lesson from the restructuring of network utilities is that there is no universally appropriate reform model (table 1). Every restructuring and privatization program must take into

account the features of each sector (its underlying economic attributes and the technological conditions of its production) as well as the country's economic, institutional, social, and political characteristics.

Table 1 Approaches to privatization and sector reform in network industries in selected developing and transition economies

	Divestitures	**Concessions and leases** (introduction of competition for the market through competitive bidding)	**Introduction of competition in the market** (such as by breaking up vertically integrated companies)	**Yardstick competition**
Sector				
Telecommunications (wireline voice)	Argentina, Chile, Cuba, Guinea, Hungary, Jamaica, Mexico, Peru, Venezuela	China, Cook Islands, Guinea-Bissau, Hungary, Indonesia, Madagascar, Mexico	Chile, Mexico, Philippines	
Electricity generation	Argentina, Bolivia, Chile, Hungary, Pakistan, Peru	China, Côte d'Ivoire, Guinea, Hungary, Mexico	Argentina, Bangladesh, Bolivia, Chile, India, Peru, the Philippines	Argentina (distribution) Chile (distribution)
Natural gas transport and distribution	Hungary, Latvia, Russia	Argentina	Argentina, Hungary	Argentina (distribution)
Railways	Bolivia	Argentina, Brazil, Burkina Faso, Chile, Côte d'Ivoire, Mexico		
Water distribution		Argentina, Brazil, Chile, China, Colombia, Côte d'Ivoire, Guinea, Hungary, Macao, Malaysia, Mexico, Senegal		

Note: Includes only countries that have privatized by transferring public facilities to the private sector, not those that have opened up sectors only through greenfield concessions or build-operate-transfer (BOT) and build-own-operate (BOO) contracts—such as China (power generation) and Thailand (telecommunications).
Source: Dnes 1995; Guislain 1997; Nellis and Roger 1994; Otobo 1998; Paddon 1998; Plane 1998; Thompson and Budin 1997.

The limits of state ownership are numerous and widely accepted. But the fact that state ownership is flawed does not mean that private ownership is better for all infrastructure activities and in all countries. Before state ownership is supplanted by another institutional mechanism, it is essential to assess the properties and requirements of the proposed alternative—not just generally but also specifically for the activity and country in question.

Telecommunications provides the most compelling case for privatization and liberalization in developing and transition economies because:

- Revolutionary technological changes have almost entirely eliminated natural monopoly.
- In most countries coverage has been very low, and easing restrictions on entry could lead to enormous gains.
- Cross-subsidies embedded in monopoly pricing structures cannot be defended on equity grounds because most people with telephone connections are relatively well-off.

- Significant scope exists for flexible pricing to alleviate supply shortages because consumers are willing to pay for new and better services, and the sector is amenable to competition.

Because of their financial, technical, and managerial resources, private entities may have a distinct advantage in this increasingly complex industry.

In many segments of the transportation sector—railways, ports, trucking, airlines, interurban busing—competition within and between modes is sufficient in most countries to justify substantial liberalization and privatization. But the case for privatizing transport network infrastructure is much less compelling than that for privatizing services operating on the network. Rail track, basic and access port infrastructure, and certain portions of airport facilities, where monopolies are unavoidable or substantial amounts of sunk capital are involved, must be regulated or even operated by the public sector.

Electricity restructuring and privatization in developing and transition economies is more problematic. Wholesale competition has worked well in industrial countries because of excess capacity, modest demand growth, and the availability of natural gas (which enabled the entry of gas-fired plants at modest scale and relatively low cost). In contrast, electricity markets in many developing countries face capacity shortages, enormous excess demand, and periodic blackouts. California's experience has shown that market liberalization under conditions of tight demand can lead to serious problems: market-clearing prices would be politically unacceptable and would likely derail attempts at radical liberalization.

The scope for introducing competition in the supply of water and sanitation services is far more limited than in other network utilities. Local networks of pipes and sewers remain the quintessential natural monopolies. Moreover, unbundling is not as attractive because increased competition in supply will likely provide far fewer benefits than in other network utilities—the costs of producing water are low relative to the value added at the transportation stage, though this may vary across countries. Greater opportunities exist to introduce competition in sewage treatment. Overall, concessions and leases will likely be the most effective way of increasing competition in the sector.

Developing Good Regulation Remains a Major Challenge for Developing and Transition Economies

Among the most critical tasks for policymakers in developing and transition economies is designing and implementing stable, effective regulation for network utilities. In many advanced industrial economies the challenge has been reforming existing regulation and reducing unwarranted governmental intrusion. By contrast, in nearly every developing and transition economy the most pressing issue is designing—from scratch—regulatory mechanisms for privatized utilities.[3]

[3] The regulatory function was not entirely avoided under state ownership. For example, service quality still had to be monitored, and prices for infrastructure services had to be set. The main difference lies in the characteristics of

For regulation to promote welfare by facilitating investment, innovation, and allocatively efficient pricing, its institutional design and substantive content must be consistent with country circumstances—particularly the country's size, institutional endowments (including checks and balances), technical expertise, auditing technologies, fiscal condition and tax system efficacy, and the economic characteristics of its industries. Thus it would be inappropriate and often costly for developing and transition economies to try to uncritically replicate the regulatory frameworks of advanced industrial countries.

In the past most developing and transition economies chose nationalization over regulation to control monopoly power in infrastructure. Thus these countries are the least prepared to develop and implement rational regulations. Yet their policymakers are quickly facing the complex second-generation regulatory issues that arise after privatization, particularly when combined with unbundling—without having any experience with the traditional first-generation issues of regulating private monopolies. Many are simply repeating the mistakes of U.S. regulation, which have taken decades to ameliorate.

Nevertheless, under external pressures many developing and transition economies have quickly adopted regulatory templates from advanced industrial economies (especially the United Kingdom and United States). With few exceptions, the specific institutional and structural features of the poorer economies have received little attention. Moreover, almost all the regulatory principles were developed in the advanced economies and have substantial informational requirements. Implementing these principles will be difficult in most developing and transition economies because of severe problems measuring relevant economic variables and a lack of proper accounting systems and technical skills. Models based on conditions and practices in industrial countries have often had only partial success—or even been outright failures.

What makes for effective regulation?

Given the importance of effective regulation for financial viability, investment behavior, and other crucial elements of infrastructure performance, regulatory procedures must be predictable, accountable, and transparent. Regulatory bodies should:

- Have competent, nonpolitical, professional staffs—expert in relevant economic, accounting, engineering, and legal principles and familiar with good regulatory practices.

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the regulatory process, which was ad hoc and opaque under the old regime—while it is required to adhere to certain transparent requirements of due process in the new setting.

- Operate within a statutory framework that fosters competition and market-like regulatory policies and practices.
- Be subject to substantive and procedural requirements that ensure integrity, independence, transparency, and accountability.

Where do things stand?

Political interference has undermined regulatory independence in many developing and transition economies. Governments, especially line ministries, have been reluctant to relegate important regulatory functions to independent agencies. Instead many regulatory agencies report to sectoral ministries and are filled with government representatives.

The label "independent" is somewhat exaggerated among new regulatory agencies in developing and transition economies. Effective regulation requires that regulators be removed from political influence and act as impartial enforcers of policies set forth in controlling statutes. But absolute independence for these agencies is neither possible nor really desirable. The executive can hardly be denied the authority to ensure that the regulators it appoints are sympathetic to its reforms and to administration policies generally.

Before privatization the state controlled every aspect of the infrastructure sectors in developing and transition economies. Ownership, operational, policy, and regulatory functions were typically fused, even when exercised by different government agencies. Thus it is not surprising that line ministries would resist having their post-reform role limited to policy oversight: assessing industry developments, reviewing the adequacy of policy in light of these developments, and enacting legislative changes.[4]

Recent surveys indicate that most regulatory agencies in developing and transition economies are not legally required to hold open meetings. Nor are they obligated to provide written justifications for their decisions. And in many economies the regulatory framework lacks coherence, with responsibilities splintered among regulatory agencies and line ministries.

One clearly emerging lesson is that although formal requirements for integrity, independence, transparency, and accountability are essential for effective regulation, they are far from sufficient. The experience so far raises doubts that governments will observe the spirit of the law and implement proper, consistent regulatory procedures—especially when their choices are influenced (and constrained) by external pressures and loan conditions.

[4] In fact as Estache (2002) has observed governments are more active players in the regulatory game than it appears because of some perverse incentives that they face. Large rents that are left by regulation to the privatized utility operators imply large income taxes. Fiscally constrained governments might therefore be tempted to use the regulatory process to prevent the redistribution of rents in order to enlarge their fiscal payoffs from privatization reforms. Thus, there could be considerable scope for implicit collusion between privatized operators and governments to weaken the regulatory process.

When assessing regulation in the developing world, it is important to remember that it took many years for advanced economies to achieve regulatory effectiveness. For example, it took decades for the United States to reach an equilibrium in which the independence of regulatory agencies was recognized, expected, and supported by administrative procedures, ex parte rules, and judicial review. In developing countries regulatory structures have been created from scratch and are still in early stages of development. But at least in terms of formal regulatory arrangements, the trend is in the right direction—greater independence, accountability, and transparency than under state ownership.

How Can Effective Regulation Improve the Investment Climate?

Arguably the strongest impetus for privatizing infrastructure in developing and transition economies has been the public sector's inability to continue financing its maintenance, modernization, and expansion. If adequate private investment does not flow into infrastructure sectors, the goals of universal service in some areas and increased services for poor people in others will inevitably suffer. And if investment is stifled by restrictive regulation, entry and competition will not materialize. Thus regulatory policies designed to encourage sustained private investment in infrastructure do more than merely serve the narrow interests of investors: they also widen access to basic services and promote competition.

Balancing regulatory commitment and flexibility

An indispensable precondition for effective privatization and sustained private investment is a country's institutional capacity to restrain arbitrary administrative action and credibly commit to a stable policy process. Developing mechanisms that enforce substantive and procedural restraints on administrative discretion and limit regulatory opportunism is especially important in infrastructure, where the establishment of transportation and distribution networks requires large, mostly sunk investments. Without government commitment to policy stability, frequent changes in regulation can have the same effect as outright expropriation of sunk investments.

Yet a good regulatory system must also be responsive to changes in industry technology, in the competitiveness of directly regulated and adjacent markets, and in demand and supply. To foster efficient performance, the system must be able to adapt its mandates and rules in response to new problems, circumstances, information, and experience. Such flexibility is especially imperative in sectors experiencing rapid technological and market changes.

The rigidity of certain features of the privatization agreements that established industry structures severely impedes solving regulatory problems in the network utilities of developing and transition economies. Such inflexibilities were needed to create commitments to reform, to consumer protection, and to the private capital needed for investment in these sectors. But they also make it difficult to adapt to emerging challenges, because operators and investors find such

adaptations threatening to the privatization commitments that protect their interests and the entire fabric of reform.

Thus there is a need to strike a delicate balance between regulatory commitment and flexibility—to limit regulatory discretion while avoiding the rigidity and paralysis of micromanaged privatizations or concessions. One way to limit government discretion in a socially desirable way is to require regulators to publicly articulate the basic economic principles that they use for policy analyses and decisions. These principles could be included in a statute or a concession agreement and should guide post-privatization governance. They must cover issues ranging from safeguarding the value of investments in infrastructure (without going so far as to shield investors from market-based risks), to protecting consumers, and to ensuring efficient, equitable tariff setting. To date, few if any regulatory agencies in developing and transition economies have articulated such principles.

Getting the economics right

Much of the discussion on infrastructure reform in developing and transition economies has correctly focused on the institutional foundations of regulatory effectiveness and nondiscretionary governance. Establishing institutional mechanisms that restrain arbitrary administrative intervention signals to potential investors that the value they add to infrastructure will not be expropriated. This type of commitment, flowing from a country's legal and regulatory systems, reduces investment risk and so the discount rate applied to net present value and cash-flow calculations.

But for any business investment plan to be feasible, basic sector economics must be right. After all, a pricing policy transparently implemented by an independent regulator will still repel investors if it does not allow for adequate revenue. Consider again the low coverage of long-run marginal costs provided by residential and industrial electricity prices in transition economies (see figure 7). Even a truly independent, transparent regulatory regime would have a very hard time facilitating private investment under such pricing conditions.

Similarly, a regulatory regime that interferes with competitiveness by disallowing flexible prices and terms or by imposing social service obligations on only some competitors will not promote efficient investment—even if institutional mechanisms provide a credible commitment to policy stability. Especially given today's extraordinarily adverse financing climate, in the second stage of reforms policymakers in developing and transition economies must focus on the economic content of regulation—to ensure an economically attractive environment for investors.

An Agenda for Action

In many developing and transition economies, network utilities have been privatized, restructured, and regulated in ways influenced by the state-of-the-art in policy, with genuine creativity applied to advance the public interest. Thus there is much to applaud in these sectors—

from their new architectures to the skills and commitment of those who crafted them, who operate in them, and who regulate them.

But even in countries where restructuring has been excellent, reforms have had unintended consequences and caused significant problems. The emerging second-generation regulatory problems in the network utilities of developing and transition economies are endemic to infrastructure sectors everywhere and largely reflect issues that arise after privatization, especially when combined with unbundling. In fact, many asserted deficiencies of their regulatory systems are similar to economic regulation as it evolved in advanced industrial economies.

Experience and economic logic suggest that post-reform improvements in performance will be limited, and probably unsustainable, unless accompanied by appropriate second-generation regulatory reforms. These include:

- Designing pricing policies that strike a balance between economic efficiency and social equity.
- Developing rules governing access to bottleneck infrastructure facilities.
- Finding new ways to increase poor people's access to services.

Many of the rules and principles for resolving second-generation regulatory issues have been developed in the context of advanced industrial economies. To be effective in developing and transition economies, they must be modified.

Policy solutions consistent with both economic efficiency and social equity are not always available or politically feasible. Thus policymakers in the World Bank's client countries face no greater challenge than to design and implement price reforms that better balance economic efficiency and distributional equity. The existing literature provides little guidance for managing the move to cost-reflective prices. Specific challenges for developing and transition economies include what standards to apply to tariff rebalancing, how fast to proceed, and how to promote universal service in a competitive environment.

The literature does offer significant advances in developing infrastructure pricing principles that replicate the behaviors and outcomes of competitive markets, and satisfy conditions for economic efficiency. But translating these principles into workable rules and actual pricing schedules has proven extraordinarily difficult and contentious. Indeed, in most developing and transition economies these principles cannot easily be translated into policies because of their information requirements and technical complexity. Thus a key challenge for applied policy research is to develop next-best, less informationally demanding variants of these optimal pricing principles—and to translate them into viable rules and procedures, especially in the face of severe measurement problems and deficient monitoring technologies.

In addition to reducing distortions and adjustment costs, pricing policies must be designed to maximize efficiency—subject to meeting certain social policy goals, such as universal access for rural and poor urban consumers. When considering and undertaking reforms, policymakers need to know existing service levels for these groups, how policy proposals will

affect them, and how to enhance their access. Although low coverage among low-income and rural households suggests that public monopolies have not successfully provided these households with access to infrastructure services in most developing countries, it is not clear that privatization and liberalization will automatically benefit them either.

Rigorously evaluating poor people's access to infrastructure facilities is imperative to developing pro-poor regulatory policies. Little consistent data exist to support the design of such policies. Thus there is an urgent need to obtain additional data on infrastructure services and low-income households. In particular, poor people's demand for infrastructure services needs to be analyzed more thoroughly—including factors that influence their decisions to connect, the role of informal providers, and how the presence of alternatives affects household connections.

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CHAPTER ONE

The New Paradigm for Utilities

The twentieth century saw most countries pursue social fairness in access to economic infrastructure — non-exploitative prices, nondiscrimination, and universal service— through government ownership and regulation (the public utility paradigm).[5] It was broadly agreed that these sectors could not be entrusted to the signals, motivations and penalties of free markets because of concerns with monopoly power and because of infrastructure's strategic importance. Most governments were also convinced that the large investments required to extend coverage required the resources of the state. This chapter explains why this consensus changed, and what it bodes for the future.

Why Focus on the Network Utilities

Network utilities have a significant share in the national product and disproportionately influence its growth [World Bank (WDR) 1994; Newbery 1999]. These industries provide services that are critical inputs to manufacturing and commerce. Indeed, economic development requires such "infrastructure" and the failure to reform and modernize these sectors risks economic stagnation and threatens national competitiveness.

The deficiencies of infrastructure, together with the weakness of management and economic organization, are likely to account for a substantial part of low factor productivity in developing countries
Stern (1991).

The report's focus on the regulatory governance of the network utilities is also motivated by their unique economic characteristics, which make them a natural target for government intervention and yet, render them particularly difficult to regulate in the public interest. These characteristics include:

[5] This refers mainly to the period after World War II. Private ownership in electricity was initially the norm in many countries in Europe and North and South America. State ownership spread later, especially after World War II, either for ideological reasons (as in England and France) or because political constraints on prices forced private firms into bankruptcy (as in Latin America). Similar situations prevailed for railroads, trucking, and water in many countries. Telephone services became captive of state-owned post offices in Europe and Japan, but not in Canada, the United States, or, initially, Latin America.

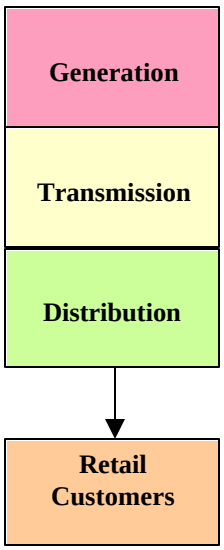
- Extensive economies of scale and scope that generally lead to market concentration and inhibit competition. So regulation cannot be completely abolished.
- High ratio of sunk costs to fixed and variable (avoidable) costs. Sunk costs are those that (in the short-intermediate run) cannot be eliminated even by ceasing production. Sunk costs deter entry because they impose a major hurdle of risk taking for a newcomer.
- Services to a broad range of users and deemed "essential", making their provision and pricing politically sensitive.

The extensive economies of scale and scope led to monopolistic organization. Significant sunk costs exacerbate the problem of market power and virtually ensure that private unregulated pricing and investment decisions will not be socially optimal. The combinations of large, durable assets that are characterized by a high degree of sunkeness and the highly politicized consumption makes the network utilities especially vulnerable to administrative expropriation—both directly and through uneconomic price controls. Foreign investors are particularly vulnerable, resulting in their demanding high risk premia. These basic features, common to varying degree to utilities across different sectors, create special challenges for effective regulation that the subsequent chapters of this report will seek to explain.

From State to Market--Evolution in Thinking about Utilities

The vertically integrated, state-owned utility became the standard industry model in electricity, telecommunications, water, gas, railways and other transportation services (e.g., Table 1.1). At the time, it seemed to represent a sensible reorganization of previously private utilities that were either highly fragmented or too large to prevent monopolistic abuse. Public ownership was promoted to secure the benefits of size, and the requisite large scale financing, without suffering the disadvantages of monopolistic pricing. Thus most of the world chose nationalization over regulation—except the United States, where the network utilities were under private ownership but subject to comprehensive regulatory controls (Laffont 2002). Still, the two different forms of ownership and regulation

Table 1.1 Vertical Integration in Electricity



were quite similar in the structure and stability of the industrial form (Newbery 2002).

At first, vertically integrated, state-owned utilities produced reasonably satisfactory results (Fare et al 1985). For example, British and French public firms were leaders in efficient utility pricing from the 1950s on (Turvey 1968). The Tennessee Valley Authority in the United States demonstrated the advantages of reaching down the demand curve by reducing prices (Scherer 1980, p. 487). In Brazil, the state-owned telecommunications company, Telebras, grew impressively after it was restructured and consolidated in 1972 (World Bank 1992).

During the last two decades, however, the monolithic model has proven progressively unsuited to the drastically altered conditions of both developed and developing economies. This has led to a profound worldwide reassessment of the traditional public policies in the network utilities.

Box 1.1 Milestones of US Deregulation

Airline Deregulation Act	1978
The Staggers Act (Rail Deregulation)	1980
The Motor Carrier Act (Trucking Deregulation)	1980
AT&T Divestiture	1984
FERC Order 636 (Gas Deregulation)	1992
FERC Order 888 (Electricity Deregulation)	1996
Telecommunication Act	1996

The reassessment of traditional utility policies begun with the regulatory reform movement in the United States in the late 1970s and early 1980s (Joskow and Noll 1994, Noll, 1999). Several historical forces propelled the revolutionary changes across a wide swath of the economy, and much of the country's public utility industries (Box 1.1): double-digit inflation, energy crises, stagflation, heightened environmental concerns, the virtual bankruptcy of backbone industries, and a perceived erosion of the country's productivity edge and its international competitiveness. Proponents of deregulation emphasized its potential to combat inflation and restore the growth in productivity by unleashing the forces of competition. Concerns about the energy crises and environmental protection facilitated the introduction of economically efficient pricing which was expected to discourage wasteful consumption (Kahn 2001).

Box 1.2 Milestones of UK Privatization

British Telecom	1984
British Gas	1986
British Airways	1987
British Airports Authority	1987
Water and Sewage Companies	1989
Electricity Companies	1990
• British Rail	1995
• British Energy (nuclear)	1996

Source: Newbery (2000).

Roughly during the same period, major sectors of the British economy were also being transformed (Box 1.2). Deregulation and new methods of regulation were introduced in the financial services and the professions. Large-scale privatization begun in 1984,

with the sale of 51 percent of British Telecom (BT) to the private sector. BT's divestiture was largely motivated by the government's desire to remove telecommunications investment off the government balance sheet in order to meet its (post-1976 IMF) targets for the level of public sector borrowing (Kay 2001). Radical regulatory reform accompanied the subsequent privatization of the utility industries (Newbery 1999). Several new regulatory institutions were established and new tasks given to existing agencies such as the Monopolies and Mergers Commission (Armstrong et al 1994).

Meanwhile, the European Union issued a series of directives beginning in the late 1980s aiming to create a single market--an area without internal borders where goods, people, services, and capital could move freely. These directives spelled out common rules for telecommunications, electricity, natural gas and transportation markets across the Member States (Box 1.3). Taken together, they mapped out a common regulatory framework and the extensive liberalization of these industries. In fact, water is the only EU network utility where liberalization is still in its infancy.

Box 1.3 EU Liberalization Directives

- Telecommunications: 1990
- Rail 1991
- Electricity: 1996
- Gas: 1998

While the US deregulated and the UK privatized, and the EU directives (which called for extensive liberalization but remained silent on the issue of ownership) were building a single market, a strong privatization movement begun to sweep the globe. Between 1990 and 2001, 132 developing and transition economies (DTEs) have taken substantive steps to introduce private participation in infrastructure sectors. During that period, over US$750 billion of investment in infrastructure projects with private participation took place in the DTEs--in

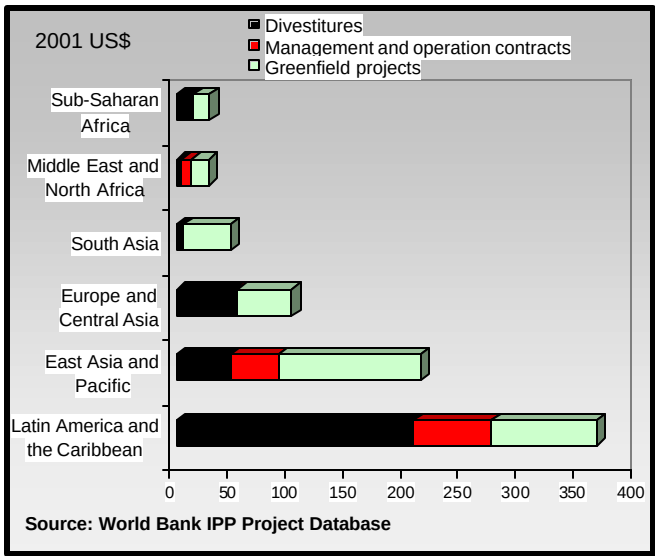
Table 1.2 Investment in Infrastructure Projects with Private Participation by Sector, 1990-2001

2001 US$ billions	Telecoms	Electricity	Transport	Water	Gas	Total
1990	6.2	1.3	10.3	-	-	**17.8**
1991	13.5	1.3	3.3	0.1	-	**18.2**
1992	7.9	8.9	4.6	2.0	4.0	**23.4**
1993	10.9	11.1	5.7	7.9	4.6	**35.6**
1994	20.3	15.2	8.9	0.5	1.8	**44.9**
1995	20.1	20.9	12.0	1.8	4.1	**54.8**
1996	29.7	30.6	17.4	1.9	3.0	**79.6**
1997	45.4	48.7	21.7	9.3	3.3	**125.1**
1998	57.3	24.6	18.4	2.4	6.5	**102.7**
1999	43.3	14.4	8.9	6.9	3.7	**73.5**
2000	45.3	26.4	11.6	4.8	2.3	**88.1**
2001	31.7	10.0	12.4	2.2	1.2	**56.3**
Total	**331.6**	**213.4**	**135.2**	**39.8**	**34.5**	**720.0**

Source: World Bank PPI

the form of divestitures, green field projects, and management and operational contracts with major capital expenditures (Table 1.2).

Fig. 1.1 Investment in Infrastructure Projects with Private Participation in Developing Countries, by Region and Type of Project, 1990–2001



The primary impetus for privatization in many developing countries came from the debt and fiscal crises that emerged in the early 1980s (Estache 1999). The extraordinary low levels of objective performance in infrastructure compared to the equivalent sectors in developed countries also played a major role. Reforms in the transition economies were motivated by similar factors beginning in the early 1990s. The external sovereign debt burden led many countries through forced fiscal adjustments which hit public infrastructure investment particularly hard. In Latin America, between 1980-84 and 1995-1998 infrastructure investment, as a percentage of GDP, declined by 2.85 points in Argentina, 3.10 in Bolivia, 3.08 in Brazil, 1.41 in Chile, 1.98 in Mexico and 1.51 in Peru (Calderon et al, 2002). While the region was experiencing a sharp contraction in public infrastructure spending, it led the world in infrastructure privatization during the 1990s (Roger 1999, Izaguirre 2002). Almost 50 percent of the total infrastructure investment with private participation (primarily through divestitures) during 1990-2001 was accounted for by Latin America and the Caribbean (Fig. 1.1).

At the same time, there was mounting evidence that public enterprises were seriously mismanaged and that the damage to the infrastructure sectors was becoming intolerable (Shirley and Walsh 2001). State-owned entities pursued multiple, poorly-defined and conflicting objectives and managers were often appointed on the basis of political loyalty, not competence. Funds for investment were often squandered through poor projects. Moreover, price controls were imposed in disregard of their performance implications, subjecting the operating entities to considerable financial distress and substantially impairing their ability to mobilize investment and provide reliable service (Kerf and Smith 1996).

Attempts at reforming the public enterprises had only very limited success [World Bank (PRR) 1995]. These efforts either did not bring the desired results or the improvements were not sustained. Very few governments were able to introduce and maintain the large number of complex and demanding policy measures needed for efficient public enterprise performance. In many countries, inefficient public enterprises, especially in the infrastructure sectors, were draining the state budgets, diverting resources from other social priorities such as health and education, undermining the banking sector, and impeding the development of the private sector. In the context of a globalized economy, the poorly performing state-owned infrastructure sectors were increasingly seen as constraining economic growth and undermining international competitiveness. Developing countries simply could not continue absorbing the fiscal burden of their state-owned enterprises. (Lieberman, 1997). It became evident to policymakers throughout the world that the long-term solution to the problems of poor service delivery, lackluster growth, and damaging political interference required radical structural changes and a realignment of the government's role relative to that of the private sector.

The Dawn of the New Utility Model

The wave of infrastructure privatization and liberalization that swept the globe during the 1990s must be seen as a significant departure from the previous economic consensus. This departure not only questioned the necessity of state ownership in these sectors, but also reexamined several preconceived notions about natural monopoly and the character of the concomitant regulatory intervention.

Unbundling—Isolating the Monopoly Parts

The public utility paradigm was premised on the assumption that each infrastructure network industry constitutes a natural monopoly in which a single firm could achieve lower costs and better service than a number of competing suppliers. The monolithic organization enshrined this view, whereby a single entity controlled all facilities, operating and administrative functions, and was obligated in accordance with its public utility responsibilities to serve on demand within its territory.

In recent years, however, there has been an increasing recognition that the network utilities are not monolithic

The monopoly-based system of service supply, which has dominated the world's infrastructure markets for almost a century, continues to decline in popularity around the world.

natural monopolies, but rather encompass several distinct activities with entirely different economic characteristics—in fact, entailing a mixture of competition and monopoly elements in supply. Technological progress, which has been proven to be a potent enemy of natural monopolies (Klein 1996), coupled with mounting evidence of the high costs of regulatory intervention, have undermined the public utility concept. Thus, it is widely accepted today that the vertically integrated utility model no longer applies and perhaps should never have been applied, across the board to all the network utilities.

Electricity, gas, telecommunications, railroads and water evolved as vertically integrated industries characterized by transportation and distribution networks linking upstream production with downstream consumption. These networks consist of: a hierarchy of transmission links in electricity; national pipelines and regional distributional links in gas; transmission media and switching centers in telecommunications; earthworks, track, signaling, and stations in railroads; and pipes and sewers in water. Most of the network elements entail substantial fixed costs that are largely sunk because the assets are of minimal value for other purposes. However, the cost conditions relating to upstream production and downstream supply activities (electricity, gas, and water), certain portions of the network (interexchange services in telecommunications), and the operation of services on the physical network (railroads) are more conducive to competition (Gray and Klein 1997). Although there are important economies of scale and inevitably some sunk costs associated with these activities, they are small in relation to those encountered in network infrastructure and, in any case, are being continuously undermined by technological change. Therefore, substantial competition could emerge in many components of these sectors (Table 1.3).

Table 1.3 Network Industries Featuring Both Competitive and Non-competitive Segments

Sector	Activities which are usually non-competitive	Activities which are potentially competitive
Railways	Track and signaling infrastructure	Train operations & maintenance facilities
Electricity	High voltage transmission & local distribution	Generation & supply
Telecoms	Local residential telephony or local loop	Long distance, mobile, and value added services
Gas	High pressure transmission and local distribution	Production, supply and storage
Water	Water distribution and wastewater	Collection and treatment

Air services	Airport facilities	Aircraft operations, maintenance facilities, and commercial activities

Source: OECD Secretariat

A new industry paradigm has emerged for the organizational restructuring of network utilities. This holds that: network utilities should be unbundled, both horizontally and vertically, with the potentially competitive segments under separate ownership from the natural monopoly network; in the competitive or structurally contestable segments, interference with the market mechanism and restrictions on ownership should be relaxed and the scope for introducing competition should be fully exploited; only the segments where natural monopoly conditions are still present and unavoidable, or where substantial amounts of sunk capital are involved, should be placed under regulation and perhaps even operated by the public sector (Guasch and Blitzer 1993).

Competition for the Market—A Promising Old Idea

Some have even questioned the need for regulating, at least extensively, the natural monopoly segments of infrastructure by drawing the distinction between competition *in* the market and competition *for* the market. Proponents of this view have resurrected an old, yet powerful idea: where a large number of firms enter non-collusive bids to become the supplier of a natural monopoly activity, the resulting price need not reflect exploitive market power (Demsetz 1968).

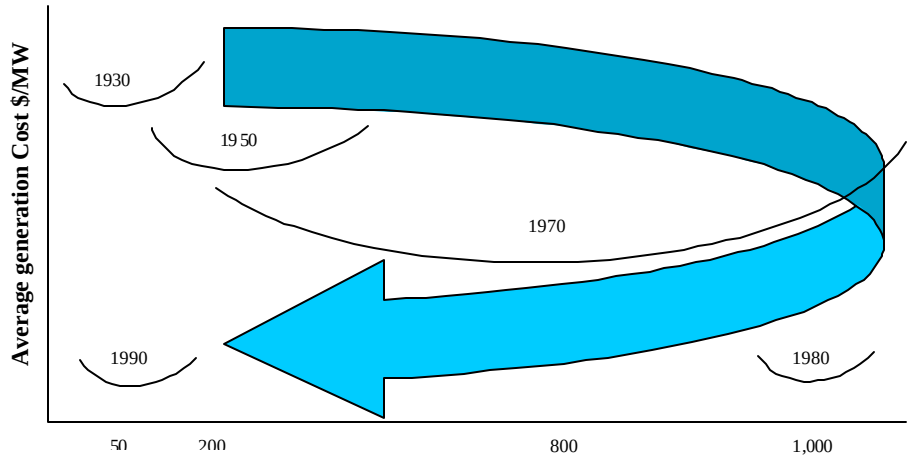
Thus, even when competition in the market is not feasible, some of its benefits could be achieved by introducing competition *for* the market. Under this approach, time-bound monopoly franchises are awarded by competitive bidding and periodically re-bid. This provides incentives for firms to perform well to retain the franchise (Klein and Roger 1994). However, franchising has some serious limitations on it own. The bidding for the franchise might be uncompetitive. Another source of difficulty is contract specification and monitoring. Product or service complexity will frequently lead to contractual incompleteness and opportunistic renegotiation.

Technological Change—Breaking Down the Monopoly Barriers

Technological innovation increasingly is the driving force behind the move toward competition in the network utilities. The market structure implications of changes in the production and distribution technologies have been especially dramatic in the electricity and telecommunications industries.

In electricity, the introduction of new technologies has significantly reduced the minimum efficient scale of generating plants, the investment costs of new units, and the time to plan and build new plants (Fig. 1.2, also see Chapter 4 and the references cited therein for a more detailed exposition). Generation is clearly capable of being structurally competitive now for many DTEs,

Fig. 1.2 Optimal Size of Generating Plants



Source: Bayless (1994)

especially those that have access to natural gas. Smaller plant sizes expand considerably the range of ownership options. Moreover, low-cost, small-scale generation units allow the production of electric power closer to the end users, thereby reducing reliance on transmission and even distribution and eventually undermining their natural monopoly characteristics as well. Small scale off-grid supply may ultimately prove a practical sensible solution to the electricity problem of many low income developing countries, especially in Africa.

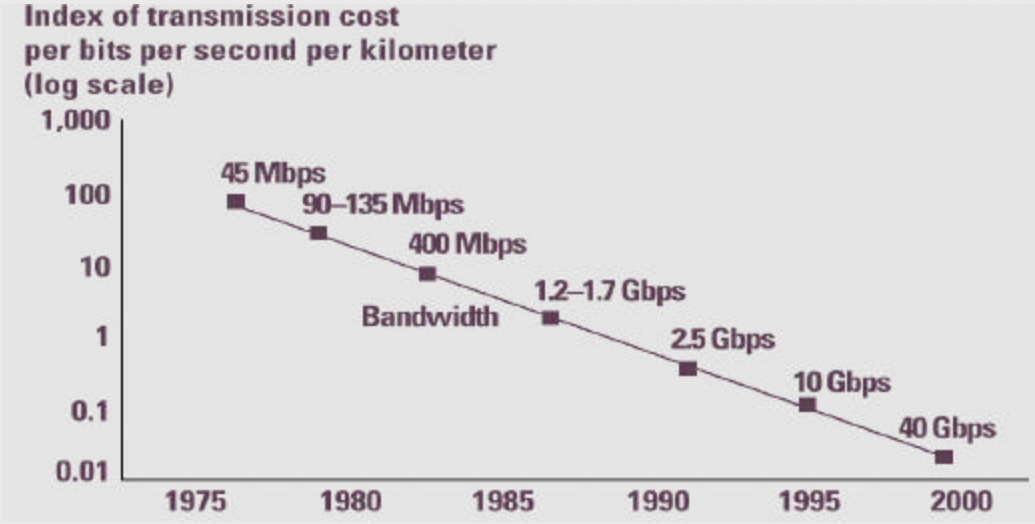
The telecommunications industry has experienced revolutionary change through advances in microelectronics, opto-electronics, fixed and mobile internet platforms, and a plethora of other exciting new technologies. (Box 1.4). These innovations have radically altered the cost structures of the industry and brought about high, continuous productivity increases.

As a result of the dramatic, albeit somewhat uneven, impact of technology, competition has intensified in many components of the telecommunications network. New entrants are accounting for an increasing share of the global telecommunications investment-- from 23.8 percent in 1996 to 33.5 percent in 2000 (Siemens 2001). Technological change has almost entirely eliminated natural monopoly in interexchange markets as evidenced by actual market tests in several countries. In contrast, the erosion of natural monopoly in local exchange service has been slower, although

competition in that segment of the market may not be absent for too long. Wireless, cable, and voice over IP technologies are beginning to seriously challenge wireline telephony (Vogelsang and Mitchell 1997, Laffont and Tirole 2000, Woroch, 2002).

Box 1.4 Technological Revolution in Telecommunications

The impact of technological change has been massive but somewhat uneven. Cost reductions have been particularly impressive in the long-distance and traffic-sensitive segments of the industry. Dramatic reductions in transmission costs have been effected by advances in microwave, satellite, and opto-electronic technologies. The impact of opto-electronics in particular has been nothing less than spectacular. Within one decade, optical systems have completely outperformed coaxial cables and fixed satellite links in long-distance high-capacity transmission (Arnbak 1997). Significant, although not as great, costs reductions in switching were induced by declines in the costs of integrated circuits and computers and software innovation. Cost reductions and significant improvements in software interfaces have facilitated a variety of data- and transmission-intensive services (Economides 1998).



***Source*: Bond (1997) and AT&T data**

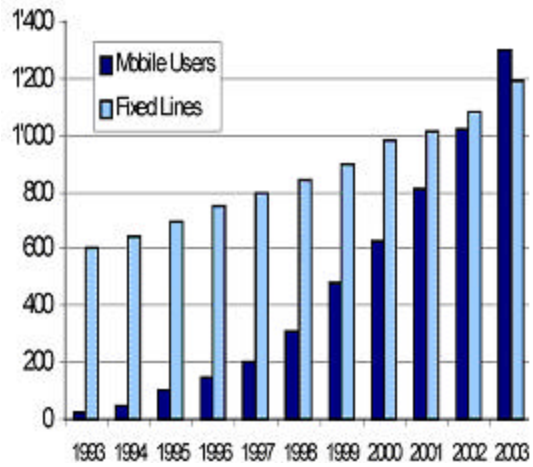
Where usage is not concentrated, however, technological change has not had nearly the same impact on costs. The nontraffic-sensitive and customer-specific loop that connects every subscriber to the central office have not experienced anywhere near the technological change that has occurred in the long-distance and other traffic-sensitive portions of the industry. For low volume nodes, the copper cable pairs continued, until recently, to represent the least-cost technology. Still, fiber optic distribution and microwave bypass have become economically viable in large office buildings.

In recent years, telephone networks have been substantially digitized. Digital bits traveling on the information highway can be parts of voice, video, or of a database or other computer applications. Voice is treated as data with specific time requirements. Digital convergence has, therefore, blurred the boundary between voice telephony and data services. If regulation-imposed price discrimination between voice and data is eliminated, arbitrage can lead to dramatic reductions in the price of voice calls that use relatively few bits. This has important implications for pricing and market structure. Internet-based telecommunications services already pose a serious threat to traditional domestic and international long-distance service providers. As the bandwidth to customers' homes increases, voice over IP is likely to become a viable option to wireline telephone. The old monolithic structure of the telephone industry is clearly both inappropriate and unsustainable

***Source:* Noll (2000).**

The rapid growth of cellular telephony (Fig. 1.3) in particular threatens to diminish the importance of scale and natural monopoly associated with the conventional local loop. Cellular telephones are very obvious substitutes for wireline service. In the early stages of its development, wireless was positioned in the market as a premium product that delivered mobility as well as connectivity and was more expensive than wireline—as such, it was mostly a supplement for basic telephony.

Fig. 1.3 Fixed and Mobile Users (World, Millions)



Source: ITU

However, the costs of wireless have been declining and in many cases (e.g. in low subscriber density areas) it is cheaper than wireline. Consequently, their substitutability will increase over time. Moreover, the much flatter average cost curves of wireless indicate that size does not confer any significant cost advantages. It is now cost effective to have several competing providers of local telecommunications services--regulated monopoly is no longer the optimal market structure. The implications for developing countries with underdeveloped fixed networks, especially in low density rural areas, are enormous.

As radio technology in the form of microwave challenged more traditional long-distance transmission systems, so radio technology in a new form is effectively challenging the traditional bastion of monopoly power: the local loop.

Technological change in the transportation sectors has been evolutionary, rather than revolutionary as in telecommunications and to some extent, electricity. The introduction of the jet engine in the 1950s and 1960s and the increase in aircraft sizes and loads made possible by the turbofan engine and improved airframe design, led to a continuous decline in operating costs and changed dramatically the competitive landscape in long-distance passenger and even freight transport. Beginning in the early 1970s, however, new engine, track, and signaling technologies

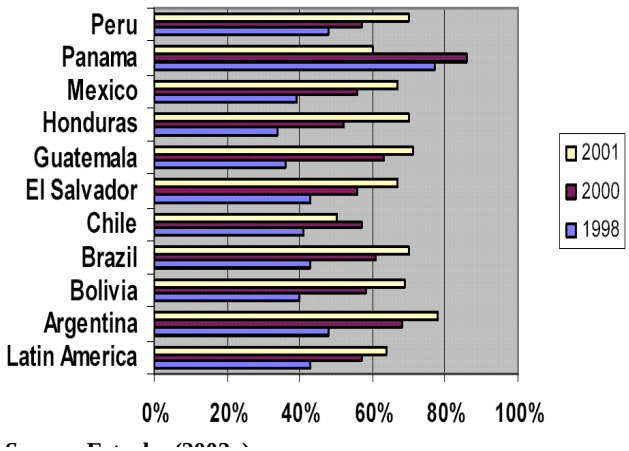
made high train speeds possible, restoring some of rail's lost competitive advantage. The introduction of multiple-axle trucks and improved road engineering altered significantly the terms of competition between trucking and railroads in freight transport. Moreover, containerization, advances in freight logistics and information technologies (e.g. real time tracking of freight containers), and intermodalism have profoundly affected both the organization and conduct of transportation markets. In the water sector, advances in telemetry and satellite imaging techniques show considerable promise for the efficient management of scarce resources.

Promises, Perils and Tradeoffs

Just a few years ago, privatization was heralded as the elixir that would transform ailing and lethargic state-owned enterprises into sources of creative productivity and dynamism for the public interest. National leaders burdened by sizeable budget deficits and stagnating economies were outspoken on the need to foster private initiative as a means of promoting growth and prosperity and enhancing the economic opportunities of all citizens. Multilateral institutions offered advice and added stimulus to this movement among their national recipients of aid. The world-wide press provided a near harmony of voices in praise of the new trend in policy thinking (Willig 1994).

Recently, the alleged "failures" of privatization have led to street riots, skeptical press coverage and mounting criticism of multilateral institutions. This hostility is not limited to a few radical protesters. Opinion polls in several DTEs, especially in Latin America, reveal growing public dissatisfaction and disenchantment with privatization (Fig. 1.4). The disapproval ratings in 2001 were higher than 2000, and the latter were higher than 1998. Almost 80 percent of the Argentines polled in 2001 disapproved of the privatization process. Employee layoffs, price increases, perceived long delays in benefits, and the distributional impacts of privatization have all contributed to this disillusionment.

Fig. 1.4 Rate of Rejection of Privatization



Efficiency Impacts of Privatization and Liberalization—Grounds for Cautious Optimism

The future course of privatization and regulatory reform in the DTEs will be determined not only by the prevailing economic and political philosophies, and macroeconomic conditions, but also by the collective assessment of the record so far. A review of the evidence suggests that while there have been disappointments, there have been substantial gains that are not always obvious. However, seeing a clear picture of results is difficult because the performance of each network utility is multi-faceted and different observers may weigh various aspects of performance differently. It is even less possible to reach an unequivocal verdict about the effects of privatization and regulatory reform on the diverse collection of network utilities and countries that have experienced them in varying ways and degrees. Assessment is further complicated by the very short time span of privatization, restructuring and major regulatory reforms in the majority of DTEs; by the severe measurement problems with respect to important economic variables; and by the fact that privatization and regulatory reform were implemented simultaneously, so it is virtually impossible to econometrically identify their separate effects. (Only in the United States, where the structure of ownership remained constant, changes in performance can be confidently traced to changes in the regulatory regime.)

All of the above measurement difficulties notwithstanding, most of the empirical evaluations of privatization and restructuring seem to be favorable (Gray 2001, Megginson and Netter 2001). At the microeconomic level, the emerging empirical evidence provides support to the view that privatization has positive effects on efficiency (labor and total factor productivity), financial performance of utilities, and service expansion. This empirical support is derived from a variety of studies that analyze the pre- and post-privatization performance of specific firms, a cross-section of firms from different industries within a given country, and a cross-section of firms from different countries (Galal et al 1994, Bourbakri and Cosset 1998, Dewenter and Malatesta 2000, Sheshinski and Lopez-Calva 2000, Delfino and Casarin 2001, Torero and Pasco-Font 2001).

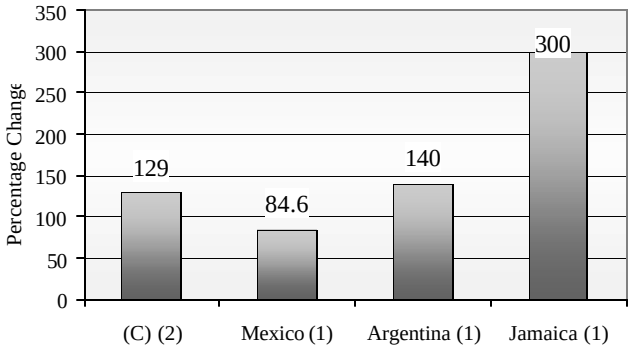
Other studies, however, are somewhat more equivocal about the economic gains resulting from privatization alone. The success or failure of privatization is found to depend on the post-privatization regulatory governance (Levy and Spiller 1996, Bortolotti et al 1998, Torp and Revke 1998, Jamasb and Pollitt 2000, Villalonga 2000, Arocena and Price, 2002) and the extent to which competition is introduced in the market (Bouin and Michalet 1991, Kwoka 1996, Kleit and Terrell 2001, Zhang et al 2002).

A detailed assessment of the post-reform performance of the transportation, electricity and water sectors is presented in chapters 3, 4, and 5. The analysis below is confined to the privatization and liberalization of the telecommunications sector, because it represents the most distinctive illustration of changing public policy towards infrastructure and the sector with the largest reform experience to date in the DTEs.

The Case of Telecommunications

Several studies provide evidence that privatization has a strong impact on network expansion. A study of telecommunications in Argentina, Jamaica, Mexico and Venezuela found significant increases in the rates of network expansion following privatization. For example, the Jamaican telecommunications firm increased network expansion from 4.5 percent in the 11 years before privatization to 18 percent per year in the first four years following privatization. Entel, the Argentine telecommunications firm, increased network expansion from about 6 percent per year in the decade before privatization to over 14 percent per year after privatization. In these instances, the network expansion resulted from a three or four-fold increase in capital expenditure compared to the period before privatization (Ramamurti 1996).

Figure 1.5 Percentage Change in Rate of Telecommunications Network Expansion



(C) Countries with per capita CDP<10,000
Sources: (1)= Ramamurti (1996); (2) = Ros (1999)

The analysis of a cross sample of both developing and developed countries found similar results on the impact of privatization on the performance of telecommunications firms. Holding other factors constant, privatization was positively associated with both a higher *level* of main lines per 100 inhabitants and higher *growth* in main lines per 100 inhabitants. This finding held true for low-income countries. For example, in countries with GDP per capita less than $10,000 that have privatized their telecommunications system, main lines per 100 inhabitants was 30.8 percent higher and growth in main lines per 100 inhabitants was 129 percent higher (Ros 1999). Moreover, privatization is positively associated with increases in operating efficiency and higher labor productivity, measured as main lines per employee. These

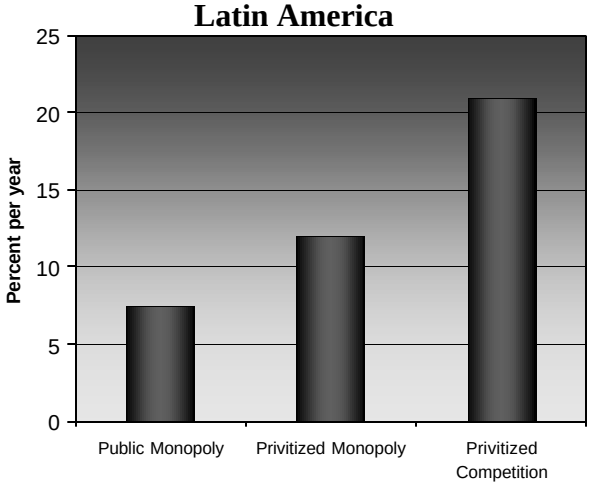
efficiency gains seem to have resulted from better incentives and productivity, rather than from wholesale firing of employees (Bortolotti et al 2001).

While these results of privatization are encouraging, there is evidence that their magnitude and incidence depend critically on the extent to which the market is liberalized and the effectiveness of the regulatory regime. The impact of competition can be particularly powerful, and Ros (1999) found that the introduction of both competition and privatization in telecommunications resulted in greater efficiency improvements than either policy alone. The analysis of a cross-section of 30 African and Latin American telecommunications industries reveals that privatization has a significant impact on performance only when it is combined with an independent regulator (Wallsten 2001).

The level and form of efficiency benefits available under private participation depend in large part on incentives created by competition and the regulatory framework (Newbery 1997).

In Latin America, countries that granted monopoly rights of 6 to 10 years to their privatized telecommunications operators achieved 1.5 times higher network expansion rates than those achieved under state ownership but only half the rate of growth of countries where the government retained the right to issues competing licenses at any time (Wellenius 1997). The complementarity between privatization and competition in spurring capacity expansion is confirmed by the cross-section analysis of wireline telecommunications performance in a large number of developing countries (Laffont and N'Guessan 2002, Li and Xu 2001). The beneficial impact of liberalization is also confirmed by the analysis of the mobile markets of several small and middle-sized emerging economies (Cote d'Ivoire, Ghana, Romania, Chile, Malaysia, Mexico, Philippines). There is strong evidence that the introduction of a competing cellular operator typically resulted in lower prices, wider service package selections, and service innovations. Moreover, the lower prices and service enhancements

Figure 1.6 Telecom Line Growth Rates in Latin America



Source: Wellenius (1997).

that resulted from competition stimulated demand in the market and led to increased subscribership for all competitors, including the incumbent wireline operator (Rohlfs et al 2000).

Distributive Impacts of Privatization and Regulation—Need for Caution

The apparent discrepancy between scholarly assessments of privatization and public perceptions may result because they use different yardsticks and time horizons. Consumers dislike higher prices, even if they result in better service. Similarly, the public dislikes labor retrenchment even when overstaffing was obvious. Tariff rebalancing, while necessary, could hurt the poor. A more comprehensive welfare assessment of privatization is required that incorporates the effects on households across different expenditure categories and on workers, in addition to impacts on firm profitability and other elements of industry performance.

Recent empirical work offers some important insights on the distributive impacts of privatization and regulation in the network utilities and highlights an important trap of the reform process in the DTEs: weak regulatory capacity. An analysis of the changes in welfare, as measured by consumer surplus, due to post-privatization price and access changes in the Argentine utilities confirms that the magnitude of these welfare changes differs across income groups and services. Welfare gains were achieved in telecommunications and electricity, but losses were experienced in gas and sanitation. Moreover, the alterations in the level and structure of prices seem to have affected poor households more severely, or to have provided the least benefit to this group (Delfino and Casarin 2001).

However, studies employing computable general equilibrium models found that all income classes in Argentina had benefited from the efficiency, quality, and access improvements due to the privatization of utilities beginning in 1990 (Chisari et al 1999, Navajas 2000). The provision of more efficient infrastructure services affects most other sectors of the economy and promotes general economic growth, which in turn enhances the economic opportunities facing the poor (Kraay and Dollar 2000). When these general equilibrium effects are taken into account, the poorest groups seem to benefit the most from the improvements in productivity and increased access that were brought about by the privatization reforms (Benitez et al 2001). The results of a recent research project analyzing the welfare effects of privatization in four Latin American countries (Argentina, Bolivia, Mexico, and Nicaragua) indicate that there is no clear pattern concerning price changes—prices went down in about half of the cases. However, there were

adverse distributive impacts on the bottom half of the income distribution due to the significant employment contractions within the privatized utilities. The negative distributive impacts of layoffs and price rebalancing were more than offset by the corresponding increases in access by the poor, enhanced service quality, and the changed structure of public finances that benefited the poor more (McKenzie and Mokherjee 2002).

There is an evident discrepancy between the accumulating statistical evidence and popular perceptions about the effects of privatization, and none of the studies reviewed here can offer an adequate explanation for the increasing popular disenchantment with the reform process. Certainly, it is possible that due to data limitations and perhaps even methodological flaws, the statistical models do not accurately measure the true welfare impact of the reforms. It is equally possible that public perceptions are subject to systematic biases. The benefits of reform are generally diffused across a large number of consumers whose individualized gains are relatively modest--certainly not the topic headline news. On the other hand, firing half the employees of a large utility is more likely to lead to protests and attract media attention, even if the specific employment contraction is small in relation to the country's aggregate labor force. Psychologists have found that individuals exhibit "loss aversion"—they react more strongly to losses than to gains relative to the status quo. They also tend to have a short time horizon--they focus much more on the immediate effects of policy reforms that might require painful adjustments, while they discount heavily the gains flowing in the future.

The Perils

Privatization's bad name is probably not fully deserved. Some of the difficulties are the result of illusion and misunderstanding by the public, and of poor communication by the political leadership. The impatience with the long delays before some of the benefits of privatization emerge reveals a lack of recognition that even in the prosperous industrialized economies, many major institutional reforms took decades to bear full fruit (Baumol 1993). But public support determines policies. It is therefore not enough to show that privatization *generally* improves matters: one must design policies that ensure that they do – and are seen to have done so.

Box 1.5 Prerequisites of Effective Privatization

- A suitable set of institutions, a suitable legal system, and a country-specific strategy
- Market-friendly institutional framework
- A microeconomic structure open to competition
- An effective system of regulation

The negative popular perceptions might also be symptomatic of a process that at times has been deeply flawed. Inter-country experience reveals the institutional preconditions for privatization to achieve its public interest objectives (Guislain 1992 and Box 1.5). To the extent that in some countries privatization was pushed in the absence of such institutional safeguards, it was clearly oversold as *the* solution to the problems facing the DTEs. The advocates of privatization may have overestimated its benefits and underestimated its costs and prerequisites. A change in the structure of ownership involves a tradeoff between different types of cost (Laffont and Tirole 1991).

The First Trap: Privatization Without Competitive Restructuring

Fiscally strapped governments could raise more revenues by selling the utility as a monopoly – with regulations that ensure this rather than promote competition – and some have done so. Prospective investors and the underwriting investment banks (whose success fees are generally calculated as a percentage of the sales price) naturally encouraged these predilections. With the intuitively appealing presumption that even a poorly designed privatization is better than continued state ownership, the international financial institutions supported such structural decisions in their client countries to "seize the window of political opportunity".

Exclusivity provisions in the privatized utilities are quite common and are rationalized on several grounds. It is argued that profit margins need to be maintained at high levels to finance the substantial new investment required; that competitive entry would harm universal service goals, because new entrants would be willing to supply only low-cost, high demand customers, undermining existing cross-subsidy systems; and that domestic market conditions are too weak and uncertain to

Table 1.4 Exclusivity Period of the Incumbent Telecommunications Operator in Latin America

	Services under exclusivity			Commencement of exclusivity	Period (years)
Argentina	LD	ND	ID	1990	10
Bolivia	LD	ND	ID	1995	6
Brazil	LD	ND	ID	1998	0.5
Chile	-	-	-	-	-
Colombia	-	-	-	-	-
Ecuador	LD	ND	ID	1995	5
El Salvador	-	-	-	-	-
Guatemala	-	-	-	-	-
Honduras	LD	ND	ID	1995	10
Mexico	-	ND	ID	1990	6
Nicaragua	LD	ND	ID	1995	4
Panama	LD	ND	ID	1997	5
Peru	LD	ND	ID	1994	5
Venezuela	LD	ND	ID	1991	9

LD= Local Distance
ND= National Distance
ID= International Distance

attract foreign investors without the assurances offered by exclusivity (Laffont and N'Gbo 2000).

The tradeoffs are quite clear. Longer exclusivity implies a higher bid price and hence high up-front privatization proceeds, while a shorter exclusivity would stimulate the economy through competition and lead to higher recurring tax revenues. However, part of the core argument in support of exclusivity is economically flawed and has predictably led to post-privatization problems.

A longer exclusivity naturally elicits a higher bid piece because a stream of monopoly profits is more valuable than a stream of competitive returns. However, in the absence of a substantial state subsidy for customers with a low ability to pay, the high monopoly prices under exclusivity reduce the demand for service. So monopoly would lead to less, not more, private investment. By contrast, lower competitive prices—so long as they yield the revenue level necessary for the network utilities to compete equally with other firms for available financing in order to maintain, replace, modernize, and expand their facilities and services—-would increase demand and therefore lead to more, not less, private investment. This argument is especially powerful in the developing countries where a significant portion of the population is characterized by a low ability to pay (Noll 2001).

One of the main arguments against liberalization is that it conflicts with network development and the promotion of universal service, under the logic that profit-maximizing firms will not find it profitable to extend service to the marginal subscribers. The emerging empirical evidence casts doubt on the validity of this argument, especially in the telecommunications sector. The results from several empirical studies (cited above) analyzing the performance of telecommunications in the DTEs seem to indicate that market liberalization spurs, and exclusivity protection retards, network development. Granting a temporary telephone monopoly increases significantly the firm's sale price, but at the

When the appropriate framework and fundamental structural conditions are in place to make post-privatization competition reasonably feasible, it would harm the public interest to privatize a monopoly via some form of exclusivity arrangements. The cross-country privatization experience in the telecommunications sector provides strong support to this claim. The added fiscal benefit that might be forthcoming to the treasury from privatizing a protected monopoly is not worth the added costs to consumers from having to deal with a monopoly, to say nothing of the subsequent losses to the economy from foregone industry vitality and progressiveness.

cost of reducing investment: exclusivity reduces network expansion by between 10 to 40 percent, and the annual growth rate of the network by more than 2 percent (Wallsten 2000).

Countries are learning from their mistakes, and those of others. In Latin America, early movers such as Mexico, Argentina and Venezuela offered between 6 and 10 years of exclusivity in their telecommunications sectors in the early 1990s. In the mid-1990s, the second wave of reformers (Peru, Bolivia and Panama) offered exclusivities between 5 and 6 years. By 1998, small and poor countries such as Guatemala and El Salvador were able to sell their telecommunications companies with no exclusivity at all. These countries were able to attract a large number of operators as well.

The damaging consequences of exclusivity are likely to be particularly severe in poor countries where the incumbent state-owned monopoly has not provided reliable nation-wide service. Those who remain without a connection to the formal monopoly network, especially the rural poor, could benefit by the availability of alternative suppliers who might utilize more effectively advances in technology and offer a wider range of price/service options than the incumbent monopolist. In the absence of competitive pressure, the privatized monopolist may remain lethargic and not innovate or expand coverage, especially if it is restricted by uniform pricing rules. Efficient solutions to the problem of expanding access, especially to the poor rural areas, will require a variety of approaches that exploit all technological opportunities and experiment with alternative forms of organizing supply. Exclusivity clearly undermines the potential for such service innovation.

Box 1.6 Getting Out of the Exclusivity Trap Can Be Very Costly

In January 1994, Lattelekom, was formed as a joint venture between the Republic of Latvia (51%) and Tilts Communications (41%) and was granted a 20-year fixed line monopoly. Tilts Communications committed to invest US$160 million in Lattelekom over a 3-year period in return for the 49% equity stake. When in 1999, the government of Latvia unilaterally shortened the Lattlekom exclusivity from 2013 to 2003, Tilts Communications demanded compensation in the amount of US$380 million. A protracted legal battle ensued which impeded the development of the sector.
Tilts Communications is jointly owned by Sonera of Finland (90%) and the IFC (10%).

The Second Trap: Weak Regulatory Capacity

Especially during the early years of the privatization process, establishing appropriate regulatory mechanisms to curb the potential abuse of monopoly power was subordinated to the immediate goal of closing transactions. Such attention as was given to regulation focused on creating the regulatory entities and writing their charters to meet the formal requirements of the privatization process or the

conditions of international organizations. Regulatory institutions were often created through simply replication of the systems from advanced industrial nations, mainly the United States and the United Kingdom.

Chapter 2 provides a detailed analysis of the problems and the reality gap characterizing this "regulatory policy transfer" to the DTEs. There was an unrealistically hopeful and fundamentally wrong presumption underlying the prefabricated approach to regulatory institutions in some DTEs: that if the issues of funding, organizational design, and internal procedural safeguards were resolved, somehow satisfactory regulatory performance would emerge, serving the public interest. This approach underestimated the probability that the same forces of political interference that rendered public enterprises in these countries such effective instruments for collecting and dispensing favors to constituents and special interest groups would seek to preserve these status quo benefits, by deliberately weakening the regulatory process.

It should have been expected that fiscally constrained governments in continual search of tax revenues would be tempted to retain political control of the regulatory process, leaving monopoly rents to the operators and subsequently taxing them away, rather than distributing the efficiency gains from privatization to consumers (Estache 2002). Because of deliberate government actions, or a historic lack of acceptance and understanding of the importance of separation of powers, it has proven exceedingly difficult to establish and maintain regulatory independence in the DTEs. Regulatory effectiveness was further undermined by the scarcity of technical expertise.

One Model Doesn't Fit All—Choosing Among Imperfect Systems

One clear lesson that has emerged from the restructuring of network utilities during the past two decades is that there is no universally appropriate reform model (Laffont 2001, 2002). Every restructuring and privatization program needs to explicitly take into account the important specific features of each utility (its underlying economic attributes and the technological conditions of its production) as well as the country's relevant economic, institutional, social and political characteristics. The cookie-cutter approach to reform is unlikely to work and would predictably lead to problems for the public interest.

The limits of state ownership are numerous and widely accepted. However, the fact that state ownership is flawed does not imply that private enterprise is a superior form of organization for all infrastructural activities and in every country setting. Before state ownership is supplanted by

another institutional mechanism it is essential to carefully assess the properties and requirements of the proposed alternative—not only in general but also specifically with respect to the activity and country in question (Box 1.4).

The benefits from privatization derive from the changed incentive structures facing firms. However, those incentives will also depend upon the competitive and regulatory framework in which the privatized firms operate (Vickers and Yarrow 1991). In many DTEs, the opportunities for introducing competition in the utilities appear limited due to the small size of their markets. Establishing the effective regulatory mechanisms that are needed, especially in the face of such naturally monopolistic small markets, is likely to be impeded by the lack of technical expertise and institutional preconditions (such as well-developed accounting systems), as well as by a resistant political and administrative culture. Thus, the relationships between privatization, incentives and efficiency are complex and the difference between public and private ownership in the DTEs will frequently be much less distinct than in countries with deeper private sector traditions and stronger institutions.

Arguably, the most compelling case for privatization and liberalization that can be made in the DTEs, is in the telecommunications sector because: (i) revolutionary technological change has almost entirely eliminated natural monopoly; (ii) in most developing countries coverage ratios have been very low and the potential gains from relaxing restrictions on entry could be substantial; (iii) the cross-subsidies embedded in monopoly pricing structures could not be defended on equity grounds, since most of those who had telephone connection were relatively well-off; (iv) the scope for pricing flexibility to alleviate supply shortages is significant, because of the high willingness of consumers to pay for new and better services and the sector is amenable to competition. Because of their financial, technical, and managerial resources, private sector entities may indeed have a distinct advantage in keeping abreast of this increasingly complex industry.

In many segments of the transportation sector (rail, ports, trucking, airlines, inter-urban busing) the pressures of inter- and intra-modal competition are sufficient in most countries to justify substantial liberalization and privatization. It is difficult for regulators or service providers to predict what are efficient and market-responsive vertical relationships and combinations of logistical roles among various rail entities, truckers, barge operators, port operators, air carriers, warehouses, forwarders, etc. The experience from both the advanced industrial economies and DTEs confirms what theory predicts: decentralized market-oriented decision-making that is freed from excessive

regulatory controls and energized by market incentives is the surest means of finding and implementing efficient and innovative solutions to the needs for these transport modes. However, it is important to draw a distinction between transport *services*, which are generally competitive or contestable, and the *physical infrastructure facilities*, which may exhibit natural monopoly characteristics. The case for privatizing the transport infrastructure is clearly much less compelling than that of services operating on the physical network. The rail track, basic and access port infrastructure, and certain portions of airport facilities, where monopoly is unavoidable or substantial amounts of sunk capital are involved, must be regulated or even operated by the public sector.

Box 1.4 Privatization May Not Be Always Advisable

Advice on privatization needs to be based on a thorough understanding of the circumstances of the particular sector in the country concerned. The case of power generation in Brazil illustrates how even policy recommendations that make sense in most contexts can be out of place.

The distinctive feature of Brazil's electricity system is that it is predominantly (95%) hydro-based, with large multi-year storage dams. In contrast to almost all other countries, the long-run marginal cost of additional hydro investment is probably lower than that of combined cycle gas turbines (CCGT). The dams are multi-use, and managing them for irrigation and other water uses requires close basin-wide coordination between the water management authorities and power dispatch.

These conditions create the strongest case for public ownership and operation of the dams, while being the least propitious for a competitive, privately owned generation market. Investing in multi-use hydroelectric projects that need coordinated regulation would entail considerable private investor risk. Dams are entirely front-end loaded, with negligible running costs but massive investment costs. The gains from private operation are thus likely to be small, and the risks that prices will be held down in periods of tight demand high. Investing in CCGT is equally unattractive to private financing. Even though from a least-cost system expansion viewpoint, some low capital cost, flexible plant may be desirable, the thermal capacity would only operate in drought years, with an overall load factor probably less than 35%. The power price would be set by hydro and would likely be unremunerative for CCGT without special payments for its role as emergency capacity or reserve.

It is therefore very unlikely that private ownership is an efficient way to plan, develop and finance the power generation sector in Brazil. It is an open question whether it would ever be in countries requiring large-scale, multi-use river basis management schemes. The most favorable circumstances would be for dams whose sole use is for hydro-electricity, and where the price of electricity is set by thermal plant, as in Chile and Argentina. Private involvement in generation has a comparative advantage where timely construction and maintenance are required to deliver possible efficiency benefits, but is least likely to work in predominantly hydro systems.

Source: **Newbery (2001).**

Electricity restructuring and privatization in the context of the DTEs is more problematic. Wholesale competition worked well in the developed economies because of excess capacity, modest demand growth, and the availability of gas that enabled entry of gas-fired plants at modest scale and relatively low cost. In contrast, the electricity markets of many DTEs face great excess demand, capacity shortages, and periodic blackouts. The experience from California has demonstrated that market liberalization under conditions of tight demand can lead to serious problems--market

clearing prices would be politically unacceptable, and would likely derail any attempts at radical liberalization.

Electricity prices have been historically low and their realignment with underlying costs has been politically prevented in most DTEs. Private entrants facing significant sunk costs would naturally demand a credible commitment that future prices would be consistent with revenue adequacy. However, most of these countries have not put in place the needed regulatory mechanisms for providing such a credible commitment. In several developing countries attempts to raise tariffs in the face of acute power shortages have led to street riots. Moreover, the electricity markets in many DTEs are relatively small—60 developing countries have a system peak load below 150 megawatts (MWs), 30 between 150 and 500 MWs, and another 20 between 500 and 1,000 MWs (Bacon 1994). Under the most favorable circumstances, the opportunities for introducing competition in such small systems will be limited. And even in a very large market such as that of Brazil, particular sectoral conditions can make privatization of electricity generation nonviable (Box 1.4). So clearly, the suitability of privatization to this sector needs to be very carefully assessed on the basis of the circumstances in each case.

The scope for introducing competition in the supply of water and sewerage services is much more limited in comparison to the other network utilities. Local networks of pipes and sewers remain the quintessential natural monopolies. Moreover, unbundling is not as attractive because the resulting benefits from increased competition in supply are likely to be considerably less than in other network utilities--the costs of producing water are relatively low in relation to the value added at the transportation stage, although this may vary across countries. The opportunities for introducing competition in sewage treatment, on the other hand, are of greater significance. Overall, franchising is likely to be the most effective way of increasing competition in the sector.

National Goals for Regulation in Developing and Transition Economies

Regulation has as its general purpose to promote efficient markets and to correct for market failures. In the infrastructure sectors which have been newly liberalized and privatized, regulation needs to focus on certain key principles to support market functioning:

- Ensuring incentives for investment—so that the reforms draw resources into the sector to expand, modernize and improve the quality of infrastructure facilities and services

- Promoting fair competition—by easing barriers to entry and allowing access of entrants to the network infrastructure
- Facilitating innovation—by focusing on goals to be achieved, leave operators and investors leeway to introduce more efficient technologies and find innovative service arrangements.

The regulator also has a major role to play to promote the public interest where market forces cannot. This includes:

- Pursuing social fairness and universal service
- Protecting public health and safety, and avoiding harm to the environment
- Ensuring that even where the private sector takes the lead, services are minimally reliable and networks interoperable.

These principles apply to regulation in any country. But the developing and transition economies, to varying degrees, pose four special challenges that realign the priorities and tighten the institutional constraints confronting regulators (Laffont 2000, Smith, 2000). These issues are the following:

The need for access. In industrialized countries (and in the relatively better-off transition countries), most residents have access to electricity, telephone service, in-house piped water, sewerage, and good transportation alternatives. Regulation can therefore focus on maintaining overall incentives for efficiency and modernization. But in the developing countries, often the majority of the population does not have access to these services at even a basic standard, and transportation and communication networks are sparse and very low quality. Large shares of the population—many millions of people—live in relatively low-density rural areas, and in urban slums, where traditional utilities do not reach. The effectiveness of any regulatory strategy must be judged by its ability to meet the goal of expanding access to basic services, rather than just improving the convenience of those who already have service.

Limited affordability. In the developed countries citizens and firms are sensitive to the pricing of infrastructure services but for relatively few is affordability a major hardship. But among the poor of the DTEs the costs of connection to infrastructure networks are often prohibitive, and past policies have discouraged a large-scale search for lower cost alternatives. Many poor people demonstrate a willingness and ability to pay the costs of efficient service provision if it were offered. Any regulatory strategy must seek to promote affordability by encouraging reduction of the costs of provision, and by providing workable and effective subsidies where needed.

Weak administrative and regulatory capacity. Many, if not most, of the developing and transition economies have an extreme scarcity of the qualified administrators and technical personnel who have both the training and experience to serve as effective regulators. Even the most dedicated professionals are handicapped in their roles by difficulties of communications and access to information within the country, shortages of middle-level personnel, and institutional norms that impede oversight by civil society and tolerate corruption. Such capacity constraints create an extra burden of proving that regulatory designs will be feasible and will promote net social benefits.

Political and regulatory risk. Most industrialized countries have relatively stable political systems and independent judiciaries, and private investors enjoy a basic trust that their rights will be protected without undue risk. But many DTEs are still undergoing fundamental political and institutional transformations. The private sector therefore perceives less security and higher political risks in making long-term investments, and therefore is wary of regulatory discretion. Without adequate safeguards against the misuse of regulation, investment flows will be discouraged and prices higher than needed.

CHAPTER TWO

Designing Regulatory Mechanisms

In an era of rapid change, one of the most challenging tasks facing policymakers in developing countries and transition economies (DTEs) is how to manage the transformation from exercising direct operational control through state ownership to a more independent process of regulatory oversight. When the privatization reforms were introduced, the DTEs had few precedents to guide their design of regulatory mechanisms. Before the 1980s, the state owned and operated core infrastructure industries in the vast majority of nations, usually as part of sectoral ministries. Only a handful of countries had privately owned infrastructure sectors. Those countries based their regulatory policy on the principle that these industries were mostly durable monopolies, and the substantive goal of regulation was to capture the efficiency benefits of natural monopoly without exploiting the consumers.

The 1980s and 1990s saw a dramatic, worldwide reassessment of the role of the state in the infrastructure sectors and of the view that most components of these industries were natural monopolies. As the DTEs began to restructure and privatize these industries, they looked to the experience of countries that were first to adopt this approach: the United States, the United Kingdom, and New Zealand. But these countries are advanced, industrial economies with a long tradition of market capitalism. They have decades of experience with the legal institutions needed to support a market economy, and their well-developed educational systems teach the analytical methods needed to effectively regulate large private monopolies while facilitating entry to the market and promoting competition. Not having these background conditions, the DTEs faced the much more difficult task of creating new, effective regulatory mechanisms (Gray 1998; Noll 2000).

Box 2.1 Characteristics of Developing Countries

- Lack of institutional checks and balances
- Low government credibility
- High incidence of capture and corruption
- Scarcity of technical expertise
- Poor auditing technologies
- Inefficient tax systems

Source: **Laffont (1996).**

The international agencies, investment banks, and financial advisers encouraged the rapid development of these new mechanisms in many DTEs. Under external pressures the DTEs speedily adopted templates from the advanced industrial economies (especially

the United Kingdom and the United States). With few exceptions, the specificities of these developing economies (Box 2.1) received little attention. Only broad-brush attempts were made to match regulatory regimes to each country's institutional and structural inheritance (Laffont 2001), and models based on conditions and practices in industrial countries frequently led to only partial success or even outright failure. Some notable examples of not getting the fit right include: the Philippines, where in the face of a weak judiciary, the adoption of the quasi-judicial US model in the telecommunications and energy sectors led to significant regulatory failure (Smith and Wellenius, 1999); and Jamaica, where the adoption of a US-style Public Utility Commission without the constitutional protections and well developed rules of administrative due process that are prevalent in the US, led to serious regulatory instability that culminated in the nationalization of telecommunications in 1975 (Levy and Spiller, 1993).

Before privatization, the state had an all-embracing role in the infrastructure sectors of the DTEs. The ownership, operational, policy, and regulatory functions were typically fused, even if they were exercised separately by various agencies of government. Not surprisingly, governments, especially line ministries, were reluctant to relegate the important regulatory function to independent agencies. They were also reluctant to limit their own interest to that of policy oversight: assessing industry developments, reviewing the adequacy of policy in light of these developments, and enacting legislative changes (Criales and Smith 1997). In Brazil, for example, the ministries of communications and mines and energy have sought to recapture some of the functions absorbed by regulatory agencies (Landau 2002). In Morocco, the telecommunications regulator (Agence national de réglementation des télécommunications), an exemplary regulatory agency in the world, has been in a continuing struggle with the ministry (Secrétariat d'État chargé de la poste et des technologies des télécommunications et de l'information) (Samarajiva, Mahan, and Barendse 2002). Most, if not all, new regulatory agencies likely fail to meet the prevalent expectation that they be independent of government and insulated from political control—an important prerequisite if privatization is to achieve its public interest objectives.

State-owned enterprises were organized to achieve a variety of political objectives, rather than to solve market failures (Guasch and Hahn 1999). They have effectively extracted rents and allocated these and other advantages to organized interests and political groups. In many instances, they have been vehicles for the corrupt activities of opportunistic public officials and other self-interested individuals. There is a clear danger that such rent-seeking coalitions would subvert the regulatory

process to avoid financial loss from privatization and competition. Groups exploit regulatory institutions and processes to their own self-serving ends in the advanced industrial economies as well. However, social welfare is at much greater risk in the DTEs because of the weak rule of law, the culture of cronyism and clientelism, and the high incidence of corruption in these countries. The substantial risks that these types of political and regulatory capture pose to the public interest have been largely ignored by the international privatization advisers and donor bodies (Laffont 2002).[6]

For regulatory mechanisms to make their intended contribution to social welfare, they need to be geared to the local capacity. However, almost all regulatory principles have been developed by advanced industrial economies and have substantial informational requirements. Their practical implementation in most DTEs is likely to be difficult because of severe measurement problems with respect to the relevant economic variables and the lack of technical skills. For example, the use of long-run incremental costs, a key concept in public utility pricing in industrial economies, is likely to be hampered in most DTEs by their lack of proper accounting systems (Laffont 1996). At least in the medium term, until they develop indigenous economic and technical expertise, they will need simple regulatory mechanisms—workable rules, second best perhaps, but consistent with local capacity. Further analytic work and technical assistance from international agencies are urgently needed.

There is also a need to critically evaluate the weaknesses of regulatory models from the advanced industrial economies before applying the models in the DTEs. For example, policymakers in the DTEs need to understand clearly what went wrong with regulation in the United States and elsewhere so not repeat the same mistakes (Box 2.2) (Joskow and Noll 1994). The lack of such critical

Box 2.2. Argentina: Repeating the Mistakes of U.S. Regulation

A review of the regulatory issues in the Argentine electricity sector in 1995 revealed that the system of pricing of transmission services was not market based but a version of economically meaningless accounting allocations. For example, payments for a new transmission line were based on a determination of the beneficiaries of the line and their calculated levels of "energy" benefits. These assessments were somewhat unrelated to the markets or to incremental transmission costs. Moreover, they depended on a version of the fully distributed cost methodology of allocating common and fixed costs, a method that was abandoned a decade earlier by regulators in the United States, where it was considered a major factor in the deterioration of performance, and virtual bankruptcy, of the railroad industry.

Source: **Willig (1995).**

[6] There are some notables exceptions. In a series of papers dealing with the architecture of regulatory governance in the DTEs, that provided the analytic foundation for the World Bank's assistance in this area, Warrick Smith has explicitly addressed the problem of regulatory and political capture and how it might affect the optimal design of regulatory mechanisms. See for example Smith (2000b).

analysis is another area of weakness in the regulatory policy transfer to the DTEs of recent years.

Regulatory Governance in Developing Countries

The benefits of privatization and market liberalization in the infrastructure sectors cannot be realized or sustained without establishing credible, stable regulatory governance as part of the reform program. Moreover, experience of the last two decades indicates the importance of planning the structure of post-privatization governance ahead of time, including the institutional architecture and the substantive economic content of that governance (Willig 1999). An inadequate focus on fundamental sector economics is a notable weakness of the privatization process in many developing countries; it is also a weakness of the technical assistance programs offered by their international advisers, including the World Bank.

Many DTEs also lack several institutional prerequisites for well-functioning regulatory mechanisms, including

- separation of powers, especially between those of the executive and those of the judiciary
- effective political and economic institutions
- a well-functioning legal system
- good contract law and mechanisms for resolving contract disputes
- a good supply of professional staff, expert in the relevant economic, accounting, and legal principles.

Well-defined and credible political institutions, as well as judicial independence, appear to be important determinants of regulatory effectiveness (Bergara, Henisz, and Spiller 1998). The DTEs will need time to establish these important preconditions.

Institutional Characteristics of Effective Regulation

The structure and process of regulation determine how effectively regulatory institutions can serve the goals of infrastructure reforms and promote efficiency and other social objectives (Smith 1997). In the last few years, a substantial body of research has examined the experiences of developing countries in reforming their infrastructure industries. Although in most DTEs regulatory policies are at a very early stage of implementation, still several lessons can be dawn that are useful guides to designing the transition to, and regulation of, privatized utilities. These lessons relate to the

characteristics of an effective regulatory system: coherence, independence, accountability, transparency, predictability, and capacity (Noll 2001).

Coherence

The elements of policy towards a regulated sector should fit logically together and be mutually supportive. The laws underlying policies must not be in conflict, and the implementing regulations must be consistent over time—as regulations are developed, each subsequent rule takes into account previous rules and, to the extent necessary, amends prior regulations to eliminate any significant inconsistencies.

Box 2.3 Romania: Lack of Regulatory Coherence

In the telecommunications sector in Romania, responsibility for overseeing pricing is spread between the National Agency for Communications and Informatics, the Office of Competition, the Cabinet, and conceivably the Competition Council. Moreover, the basis for deciding which prices ought to be regulated is unclear and produces strange anomalies, such as the absence of regulation of interconnection between any two operators other than Rom Telecom, the dominant carrier. Moreover, none of these entities is required to clearly articulate its principles for policy setting, and none has the authority to require information about costs from firms in the industry. As a result, pricing decisions are uncoordinated and piecemeal, and inconsistencies among them (such as differences in usage prices for local service, for interconnection between Rom Telecom and mobile carriers, and for interconnection between mobile carriers) are not explained by any entity.

Source: **Noll (2000).**

An important requirement for coherence is a clear demarcation of responsibilities among national regulators, provincial or municipal regulators, and ministries. The clear assignment of regulatory responsibilities and jurisdictions ensures that decisions in a particular area of regulation are always made by the same agency. This usually implies some continuity in the people and methods used in decision making and makes adherence to the rule of law more likely. Also, regulatory responsibilities that must be delicately harmonized should be kept together within a single agency and not be counterproductively splintered. For example, since privatization of the Argentine telecommunications sector, end-user rates have been under the purview of the Secretariat of Energy and Communications, whereas access prices and cost reporting by the operators have been the responsibility of the sector's regulatory agency. However, the regulations for end-user and access rates need to be closely harmonized, and both institutions should base their decisions on cost data.

The agency should have a statutory obligation to publish a formal statement outlining its policy for making decisions on entry, pricing, and all other elements of industry behavior that are subject to regulatory oversight. This would be extremely important because it would allow both firms and

consumers to build realistic expectations of how they will be treated in the future, and it would force the government to think through its long-term policy objectives and regulatory principles. Accountability and predictability will be enhanced if the regulatory agency states its objectives clearly and commits to reaching decisions through publicly articulated economic principles (Box 2.3).

Independence

Effective regulation requires some independence of the regulators from political influences, especially on a day-to-day or decision-by-decision basis. The agency must an impartial, objective, nonpolitical enforcer of policies set forth in the controlling statutes, free of transitory political influences (Box 2.4).

Box 2.4. Latvia: Lack of Regulatory Independence

In March 1999, the Telecommunications Rate Council in Latvia approved significant increases in telephone rates, to take effect on 1 April. The minister of Transportation declared that the rate increases were unfair to consumers, as the Council had not adopted a procedure for consumers to request compensation for low-quality telephone connections. In a manner not clearly provided by law, the minister annulled the council's decision to raise the rates. At the request of the Council, the Ministry of Justice evaluated the legality of the annulment and declared legal. The Latvian parliament backed the Ministry of Justice and the transport minister, arguing that the annulment was valid and that the council had failed to safeguard the interests of consumers. The government then announced that a new council would be formed, and at the end of May it removed the council members.

How much authority should members of the executive branch have to determine regulatory policies? Clearly, absolute independence of these regulatory agencies is neither possible nor really desirable. The executive branch can hardly be denied the authority to ensure that the regulators it appoints are sympathetic to the sector reforms and to administration policy generally. However, if the regulators have no insulation from political intervention, the regulatory process may itself become politicized, decisions may be discredited, and policy may lack continuity.

Clearly, some compromise is needed to ensure that the regulator is both independent and responsive to the broad policies of an elected administration. Several formal safeguards can be implemented to achieve such compromise:

- Providing the regulatory agency with a distinct statutory authority, free of ministerial control
- Prescribing well-defined professional criteria for appointments
- Mandating the participation of both the executive and the legislative branches of government in the appointment process

- Appointing regulators for a fixed period and prohibiting their removal, except for clearly defined due cause (subject to formal review)
- Staggering the terms of the agency's board members so that they can be replaced only gradually by each successive administration
- Funding the agency's operations with user fees or levies on the regulated industry, to insulate it from political interference through the budget process
- Exempting the agency from civil service salary caps, to enable it to attract and retain well-qualified staff
- Prohibiting the executive from overturning the agency's decisions, except through new legislation or appeals to the courts on existing law.

Accountability

The independence of the regulator needs to be reconciled with its accountability, as well. Allowing a regulatory body to set prices and service-quality standards and effectively change the rules of the game gives it an enormous amount of power to redistribute rents. Without an accompanying obligation to be responsible and respect previous decisions and the legal rights of all parties, a regulatory body would have considerable leeway for opportunism. Therefore, checks and balances are required to ensure that the regulator does not become capricious, corrupt, or grossly inefficient. Citizens and regulated firms alike should be able to find out who is responsible for a decision and the basis for it and be able to effectively voice their concerns (Box 2.5). The litmus test is whether affected parties can easily and quickly obtain redress when the regulatory body has acted arbitrarily or incompetently.

Box 2.5 Brazil: Regulatory Accountability

The National Telecommunications Regulatory Agency (ANATEL, Agência Nacional de Telecomunicações) of Brazil has introduced a number of innovative regulatory mechanisms. In December 2000 it became the first telecommunications regulatory agency in the world to receive ISO-9001 certification, an internationally accepted technical standard for handling customer requirements. ANATEL's website gives all Brazilians an opportunity to be informed and participate in the agency's activities. It also contains annual updates on how operator compliance; comments made during consultations; all telecommunications laws and decrees; and best prices and tariffs available from operators. Files can be electronically submitted in public consultations. In 1998, the site had 13,000 pages. By 1999, it had grown to almost 23,000 pages.

ANATEL's annual reports are assessed by the Advisory Council, an institutional body comprising representatives from society, and the Council's assessments are published in the official gazette and on ANATEL's website. ANATEL also has an ombudsperson who produces biannual critical evaluations of its performance.

Source: **ITU (2001).**

Striking a proper balance between independence and accountability is a delicate and difficult task. Some concrete measures can be adopted to strike this balance:

- Writing statutes that clearly specify the duties, responsibilities, and rights and obligations of the agency and differentiating between primary and secondary objectives, when there are multiple goals
- Subjecting the agency's decisions to review by the courts or some other nonpolitical entity
- Mandating annual reports by the agency on its activities and requiring a formal review of its performance by independent auditors or oversight committees of the legislature
- Removing regulators if they show evidence of misconduct or incompetence
- Requiring the agency to allow interested parties to make submissions on matters under review and requiring the agency to publish its decisions and the reasons for those decisions.

Box 2.6 Peru: Regulatory Transparency

In Peru, the Supervisory Authority for Private Investment in Telecommunications (OSIPTEL, Organismo Supervisor de la Inversión Privada en Telecomunicaciones) is responsible for regulating and supervising the telecommunications industry. It monitors compliance with concession contracts and quality standards, it sets prices, and it ensures a competitive market structure.

OSIPTEL has transparent and credible mechanisms for formulating norms. For instance, the agency requires that any regulatory proposal be supported by a technical study of net welfare benefits and best practices. After being reviewed by the Oversight Board of OSIPTEL, each proposal is published in the official gazette and submitted to a 30-day consultative period. In some cases, the procedure also includes public hearings, where all interested parties may discuss their positions. OSIPTEL has also created ad hoc independent committees to solve disputes between companies. Supported by specialists on the issues under dispute, these committees attempt to reconcile the interested parties. However, they reserve the right to dictate a solution if the parties are not able to reach an agreement. OSIPTEL has created an internal tribunal to handle consumer complaints that are not satisfactorily managed by the telephone companies.

Transparency

The existing regulatory rules and policies, the principles for making future regulations, and all regulatory decisions and agreements should be a matter of public record. This record must be accessible to all market participants, not just firms that supply services. Users of services need this type of information to make long-term business plans. Transparency is necessary to induce investment by both incumbents and new entrants in the sector and to avoid the costs and delays of regulatory disputes over whether an activity is permitted (Box 2.6). Infrastructure regulation is an important policy issue, and in a democratic society all citizens need information about policy to evaluate the performance of government so they can express approval or disapproval in the political process.

Transparency is an important safeguard against corruption in regulatory policy. Transparency also lessens the likelihood that citizens (especially those adversely affected by a regulatory decision) will believe that important regulatory decisions are corrupt. If regulatory decisions, including the principles and evidence that guided them, are clearly articulated in written form, the reasons for them will be apparent. Corrupt decisions will be easier to detect and more difficult to defend.

Predictability

Regulatory agencies are predictable if they adhere to the rule of law. The most important features of the rule of law are respect for precedent and the principle of *stare decisis*. Respect for precedent means that regulators do not reverse policy decisions unless there is evidence that those decisions have led to significant problems; *stare decisis* requires that cases with the same underlying facts be decided in the same way every time.

Efficient development and use of infrastructure require substantial long-term investments. Market participants need to be reasonably confident that the rules of the game will not suddenly change, either because of a change in the overall regulatory framework or because of a change in the ways regulators make decisions within this framework (Box 2.7). Regulatory uncertainty will adversely affect the scope, quality, and size of infrastructure.

Box 2.7. Argentina: Lack of Transparency and Predictability

A review of the Argentine gas sector in 1996 uncovered investor concerns about the transparency and predictability of the National Gas Regulatory Authority (ENARGAS, Ente Nacional Regulador del Gas). In one case, ENARGAS did not permit the pass-through to consumers of wholesale prices charged by the dominant gas producer, YPF, to distribution companies. ENARGAS had used its authority to regulate the transportation and distribution parts of the industry to regulate the field price as well. ENARGAS's decision was a means of indirectly controlling the market power of YPF, and it effectively changed the rules of the game, since the field price of gas had been deregulated as part of the privatization process. Moreover, ENARGAS had stated no coherent principles or predictable basis for deciding what price levels for gas were acceptable. Additionally, there were complaints about capricious penalties for violations of gas-quality standards. Although in one case ENARGAS had reversed its earlier decision after operator complaints, criticism arose about the lack of structure and transparency in imposing penalties.

Source: **Kahn (1996).**

Capacity

The regulatory agency's policy responsibilities need to match the resources at its command, if it is to carry out its mandate. The tasks associated with some of its functions (for example, monitoring industry performance, analyzing cost data, and dealing with information asymmetries and strategic behavior of the regulated firms) require highly developed economic, accounting, engineering, and

legal skills (Estache and Martimort 1999). The scarcity of such expertise in many DTEs poses an acute challenge (Box 2.8). In many developing countries, the allocation of staff and budget resources is not the result of a careful, rational planning process. The regulator seem to give highest priority to the purely technical functions, such as monitoring technical standards and quality requirements, and to the setting of fees for the industry to cover regulatory costs.

Effectiveness of Regulatory Systems: Early Appraisal

The transition from monolithic state-owned monopolies to regulated private entities is still ongoing in most DTEs. Thus, regulatory institutions in those countries have generally not been in existence long enough to permit a definitive assessment of their effectiveness and their impact on post-privatization industry performance. The ratio of objective empirical research to didactic policy advocacy is still very low.[7] Still, several empirical regularities provide insights for the current debate on appropriate regulatory frameworks for developing countries.

Box 2.8. Ukraine: Lack of Regulatory Capacity in the Energy Sector

The National Electricity Regulatory Commission of Ukraine (NERC), established in 1994, was one of the first independent regulators in postsocialist countries. In 1997, about 70 percent of NERC's specialists were engineers, 20 percent economists, and 10 percent lawyers. All the economists but one graduated from soviet universities in the period 1965–1981. The commission has no specialists in regulatory economics, and Ukraine offers no academic training for energy regulators. This lack of expertise has led to a revolving-door problem. Key specialists and officers have left NERC to join private companies regulated by it, exacerbating problems of pro-industry bias and potential capture. For example, the heads of the pricing and licensing departments who joined private distribution companies were instrumental in obtaining a beneficial pricing rule for their companies.

Source: Tsaplin (2001).

One lesson clearly emerging is that the formal requirements of independence, accountability, and transparency are far from sufficient, although they are needed for effective regulation. The experience so far raises doubts that governments will observe the spirit of the law and implement proper and consistent regulatory procedures, especially when a country's choices are influenced by external pressures and loan conditionalities. The regulatory frameworks and the attendant institutions may not operate in practice as expected, if they are transplanted without taking into account each country's unique constitutional, legal, and public interest mechanisms (Stern 1997).

[7] It should be noted that this deficiency in our knowledge about regulation in developing countries is being rapidly redressed. For example, the papers of Antonio Estache and his coauthors that are being cited in this report represent an important methodological advance and are making a very valuable contribution to our state of knowledge.

Progress Toward the Benchmarks of Regulatory Effectiveness

How well have the regulatory agencies of the DTEs performed so far, especially in attaining the institutional attributes of effective regulation? On paper, these countries seem to have made considerable progress in establishing independent regulatory bodies. How these agencies will work in practice in the years ahead is a major question, with several dimensions to consider. The record so far is decidedly mixed, and initial developments in some countries are discouraging.

Casual empiricism suggests that regulatory independence has been compromised in some countries and sectoral settings. Even some early reformers in Latin America whose regulatory frameworks closely follow the U.S. model in theory have not achieved independence in practice. In Chile and Colombia, the independence of their respective regulatory bodies in the power sector—the National Energy Commission (CNE, Comisión Nacional de Energía) and the Energy and Gas Regulatory Commission (Comisión de Regulación de Energía y Gas)—has been questioned because of the presence of government ministers on their boards. Furthermore, the independence of these two agencies has been compromised by their reliance on budget allocations made by ministry officials. Lack of independence allegedly led to the resignation of CNE's executive secretary in 1999.

Political interference has also undermined the independence of the electricity regulatory agencies of Guatemala and Peru. In contrast, a fair degree of autonomy has been achieved in El Salvador and Nicaragua and to a lesser extent in Ecuador and Honduras (IADB 1999). In Jamaica, the multisectoral Office of Utilities Regulation, which began work in 1997, was handicapped by defective legislation. It could only act in an advisory capacity, as decisionmaking authority was vested in the line ministries (Stirton and Lodge 2001). In Costa Rica, government interference, especially in tariff adjustments, has weakened the independence and effectiveness of the multisectoral Regulatory Authority of Public Services (Autoridad Reguladora de los Servicios Públicos).

In Argentina, the two regulatory agencies in the power sector, the National Electricity Regulatory Authority (Ente Nacional Regulador de la Electricidad) and the National Gas Regulatory Authority (Ente Nacional Regulador del Gas), are reasonably independent. However, concerns have been expressed about the lack of transparency and predictability in some of their decisions (see Box 2.7) and the absence of any systematic external scrutiny of their administrative procedures and practices (Estache 1997). Similar problems of transparency also initially plagued the water regulator, the

Tripartite Agency for Sanitation Works and Services (Ente Tripartito de Obras y Servicios Sanitarios). In the first few years after its creation, the telecommunications regulatory authority, the National Telecommunications Commission (Comisíon Nacional de Telecomunicaciones), lacked both independence and transparency.

In Mexico, the frontline telecommunications regulatory agency, Cofetel (Comisíon Federal de Telecomunicaciones), is not autonomous. In most cases, its decisions must be approved by the Secretariat of Communications and Transport (SCT, Secretaría de Comunicaciónes y Transportes) before they are adopted, which makes them more political than is necessary or desirable. Cofetel's commissioners, though appointed for fixed terms, can be removed by the SCT. Moreover, Cofetel's procedures are neither transparent nor open. In nearly all cases (and especially with respect to pricing), the agency develops regulations through secret bilateral negotiations on a case-by-case basis, rather than through open rule-making proceedings in which industry, users, and disinterested experts may participate. No other parties have the right to participate in these bilateral negotiations, including the antitrust authority (Comisíon Federal de Competencia), despite its interest in the competitive effects of interconnection rules (Noll, 2001).

In Hungary, the independence of the energy regulator, the Hungarian Energy Office, is limited by several factors: lack of an autonomous revenue source, no fixed-term appointments for the board of directors, lack of well-defined criteria for the directors' appointment and dismissal, and the imposition of civil service pay-scale caps on its staff. In telecommunications, the head of the Communications Authority reports to the Minister of Transport and Communications.

In the Czech Republic, both the energy and the telecommunications sectors lack independent regulatory bodies. This is not surprising in view of the hostility the government (or, more accurately, the prime minister) publicly expressed toward specialist regulatory agencies during the early years of transition. Thus, in the energy sector, the Ministry of Finance has the final authority to regulate the prices for gas and electricity, while the Energy Regulation Administration is located in the Ministry of Industry and Trade. Similarly, the primary regulator in the telecommunications sector, the Czech Telecommunications Office, is located within the Ministry of Transport and Communications. In the Polish power sector, in contrast, the Office of Energy Regulations meets most of the formal prerequisites of independence. In Latvia, the multisectoral regulatory agency, the Public Utilities Commission, enjoys financial independence from the state budget and has shown considerable commitment to transparency and accountability. However, its independence is

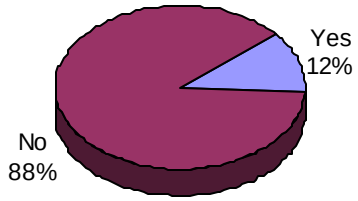
compromised by the close affiliation of its board members with the political parties that nominate them.

In Romania, the regulatory structure in the telecommunications sector lacks coherence (see Box 2.3), and the gas regulator, the National Regulatory Authority in the Natural Gas Field, lacks any semblance of independence: the chair and vice-chair are appointed by the Minister of Industry and Trade, who can also appoint three civil servants to the board, ensuring complete day-to-day ministerial control over the regulatory agency. In electricity, however, both Romania and Bulgaria have taken bold steps to create independent regulatory bodies. In Romania, the National Electricity and Heat Regulatory Authority was designed a U.K.-style, independent regulatory office, while in Bulgaria, the State Commission for Energy Regulation incorporated several elements of the independent U.S.-style commissions (Stern 2000).

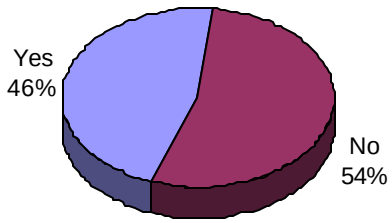
A recent survey of telecommunications regulatory agencies of DTEs indicates that the majority (36 of the 41 agencies surveyed, including those of such advanced reformers as Chile) are not required by law to hold open meetings, an important element of transparency (Figure 2.1, panel A). These findings suggest a limited tradition of even *formal* transparency in regulatory institutions and perhaps a continuing lack of appreciation of its enormous importance (World Bank 2001). It appears, however, that in practice many of these agencies (27 out of 41) open at least some of their meetings to the public. Furthermore, the majority of these agencies (22 out of 41) do not have a statutory obligation to provide written justifications or explanations for their decisions, another important element of regulatory accountability and transparency (see Figure 2.1, panel B). A similar survey of energy regulators uncovered an even weaker commitment to transparency: more than half reported not opening their meetings to the public (World Bank, 2002).

Fig. 2.1 Results from a Survey of Telecommunications Regulators

A. Are regulatory meetings required by law to be open?



B. Are regulators required to provide written explanations of their decisions?



Source:World Bank (2001).

Case-study appraisals of the regulatory governance structures in the infrastructure sectors of six Asian developing economies (Bangladesh, India, Indonesia, Malaysia, Pakistan, and Philippines) identified significant weaknesses in coherence, transparency, and accountability. On a qualitative progressive ranking from A (highly unfavorable basis for private investment) to B, C, D, and E (best practice), only two sectors were ranked better than C on transparency or accountability: the Orissa electricity and telecommunications sectors in India. Only one sector (Orissa electricity) received a ranking better than C on coherence (Table 2.1). In general, the rankings are uniform across the various industries within each country, perhaps signifying the importance of country-specific characteristics in regulatory design. Other countries in the region provide clear examples of governments' reluctance to cede control over previously legitimate government functions to new-fangled independent regulatory agencies. For example, in the first phase of Sri Lanka's telecommunications reforms (1991–1996), the government insisted on keeping the regulatory agency as a government department, despite clear evidence that it was unable to attract the needed technical expertise (Samarajiva 2001).

Table 2.1 Rankings of Asian Regulatory Framework, 1998

Country & sector	Categorization by Criteria				
	Coherence	Independence	Accountability	Transparency	Predictability
Bangladesh					
Electricity	B	B	B	A	A
India					
Electricity, Federal	B	C	B	C	A
Electricity, Orissa	D	E	D	E	B
Gas	A	A	A	C	A
Telecoms	C	D	D	E	C
Indonesia					
Gas	A	A	A	A	A
Transport	A	A	A	A	A
Malaysia					
Telecoms	C	C	B	A	A
Transport	C	C	B	A	B
Water	C	B	B	A	B
Pakistan					
Electricity	C	D	C	C	B
Philippines					
Electricity	C	C	B	B	C
Water	C	C	C	C	B

Source: Stern and Holder (1999).

Many countries in Africa have established regulatory agencies for their utilities. These agencies face several important challenges, such as obtaining adequate financial resources, technical expertise, and clear statutory authority. In many cases, these agencies are mere extensions of their respective sectoral ministries, which continue to keep a tight grip on the regulated sectors and still perform key oversight functions. A recent report analyzing the telecommunications regulatory frameworks of 29 countries in the region underscores the problems of independence and transparency (EIU–Pyramid Research 1999). On a ranking of 1 (lowest) to 4 (highest), 23 of the 29 countries examined received the lowest score of 1 on autonomy, and only 2 countries (Mauritius and Sudan) received a score of more than 2 (Table 2.2). Although the rankings on transparency were somewhat better, still 10 countries received the lowest score of 1, and only 2 countries received a score of more than 2 (again Mauritius and Sudan).

Table 2.2 Scorecard of Telecommunications Regulatory Agencies in Africa

	Autonomy	Credibility	Transparency	Efficiency	Overall
Algeria	1	2.3	2	1.7	1.5
Angola	1	1	1	1	1
Benin	1	1	1	1	1
Botswana	2	3	2	3	2.3
Burundi	1	1	1	1	1
Cameroon	1	1	1	2	1.1
CAR	1	1	1	2	1.1
Cote d'Ivoire	1	3	2	3	1.8
Gabon	1	1	1	2	1.1
Ghana	1	2	2	1	1.4
Guinea	1	2	2	1	1.4
Kenya	1	2	2	1	1.4
Libya	1	1.7	1	1.7	1.2
Madagascar	1	2	2	2	1.5
Malawi	1	1	1	1	1
Mauritius	3	2	3	3	2.8
Mozambique	1	2	2	2	1.5
Namibia	2	2	2	2	2
Nigeria	1	1	2	2	1.3
Senegal	1	2	2	2	1.5
Sudan	3	2.7	3	2.7	2.9
Tanzania	2	2	2	1	1.9
The Gambia	1	1	1	1	1
Togo	1	1	1	1	1
Tunisia	1	2	2	2.7	1.6
Uganda	1	2	2	1	1.4
Zambia	1	2	2	1	1.4
Zimbabwe	1	1	2	2	1.3

1=lowest: 4=highest
Source: Pyramid Research.

An Institutional Mismatch? Or Just the First Stage of an Evolutionary Process?

The label "independent" is somewhat exaggerated in the case of new regulatory agencies in DTEs. In many instances, for all practical purposes these agencies report to sectoral ministries and are filled with government representatives. Moreover, good regulatory practice for transparency is quite limited in most of these countries.

Still, one's assessment of regulatory governance in the developing world is closely determined by one's attitude toward regulation itself. At one extreme, an optimistic observer would point out that the developing countries' regulatory structures have been created from scratch; they are still in the early stages of development; and at least in terms of formal regulatory arrangements, the trend is in the right direction—greater independence, accountability,

and transparency than under state ownership (for telecommunications, see Table 2.3).We should also keep in mind that it took many years for the agencies of advanced economies to attain the various attributes of regulatory effectiveness.

At another extreme, a pessimistic observer would insist that the widespread reluctance of governments to give up regulatory control is more than a symptom of the early stages of an evolutionary process. Instead, it represents a deliberate attempt to use the regulatory process to protect certain favored interest groups whose status quo benefits under state ownership would be threatened by market liberalization and privatization (Noll 1999). Alternatively, it could be argued that any expectations of regulatory independence and transparency were simply too unrealistic. In many instances, under pressure from the international financial institutions, countries, especially in Eastern Europe and Africa, adopted regulatory structures that were not consistent with their political, institutional, and human resources and endowments (Laffont 2001). One could not reasonably expect strong regulatory independence to rapidly emerge in countries where the separation of powers and the concomitant checks and balances are not preeminent elements of the political and legal structures. It is therefore an open question whether these countries will in practice honor the commitments they made (especially those made under pressure) to regulatory arrangements (Box 2.9).

Table 2.3 The Regulatory Framework Index for Telecommunications

Country	1980-1989	1991-1997
Argentina	0.34	0.72
Barbados	0.48	0.48
Belize	0.36	0.69
Bolivia	0.34	0.50
Brazil	0.34	0.53
Chile	0.70	0.72
Colombia	0.34	0.67
Costa Rica	0.14	0.40
Dominican Republic	0.62	0.63
Ecuador	0.14	0.63
El Salvador	0.14	0.25
Guatemala	0.34	0.44
Guyana	0.28	0.80
Honduras	0.14	0.36
Jamaica	0.48	0.66
Mexico	0.34	0.49
Nicaragua	0.14	0.34
Panama	0.14	0.24
Paraguay	0.14	0.36
Peru	0.34	0.67
Suriname	0.14	0.14
Trinidad and Tobago	0.64	0.85
Uruguay	0.24	0.37
Venezuela	0.34	0.61

Source: Gutierrez (2002).

The truth probably lies between these two extremes. Some of the asserted deficiencies of the regulatory systems of DTEs are arguably characteristic of economic regulation as we have observed it in the advanced industrial economies (Kahn 1996).

The Structure of Regulatory Institutions

Several important decisions need to be made regarding the organization of regulatory governance: (a) demarcation of regulatory responsibilities among national and subnational tiers of government; (b) industry-specific versus multisectoral regulatory agencies; (c) allocation of functional responsibilities (for regulation of prices, licensing, quality, environmental effects); and (d) relationship with sectoral ministries and with competition or antitrust authorities. The economic and technological characteristics of the regulated industry, as well as the country's available resources (including human resources), will affect the institutional architecture of regulatory governance. Moreover, effective regulation requires both an administrative body (to execute it) and a political institution (to ensure its legitimacy) (Aubert and Laffont 2000). Formal regulatory structures that seem optimal in theory may be impossible to implement when political constraints are taken into account.

Different countries have arrived at different institutional structures for regulating their network utilities (Table 2.4).

Vertical Location

The theory of institutions, as well as regulatory-design experiments, in industrial countries and, more recently, developing countries points to the need to make several important tradeoffs in

Table 2.4 Alternative Approaches to Structuring Regulatory Agencies

Industry-specific (for example electricity, gas)	Sectoral (energy, communications, transport)	Multiple
Argentina	Brazil (federal)	Australia (state)

Box 2.9 Bulgaria: Regulatory Independence in Practice

In September 1999, as a condition of the IMF's stabilization package, the State Commission on Energy Regulation (SCER) was established in Bulgaria; it had to start functioning as an independent regulatory commission by July 1, 2000. SCER's statutory authority included price regulation and the issuance of licences and permits, and it was to exercise this authority independently, free from political interests .
In June 2000, the Council of Ministers voted to remove all but one of SCER's members barely one month after it completed its first major task. Although members of the independent commission could be removed only by the prime minister, for serious misconduct, the government gave no explanation for replacing the five board members. The members of the board themselves also refused to comment on their own removal; however, one observed that it was not his place to criticize the decisions of his superiors.

designing the structure of regulatory governance (Smith 2000b).

Potential Advantages of Decentralized Responsibility

Assigning responsibility for utility regulation to lower tiers of government has several advantages. Decentralization allows regulation to be shaped by local conditions and preferences; it brings the regulator closer to the front line of service delivery, thereby allowing the regulator to gather better information on firms and consumers; it can promote creative competition among subnational regulators to innovate and improve the quality of regulation to attract private investment (Tiebout 1956; Oates 1999); and it may permit more effective enforcement of regulatory decisions (Laffont and Zantman 1999).

Potential Advantages of Centralized Responsibility

Decentralization also has disadvantages that support arguments for centralizing regulatory responsibility. A national-level regulatory structure makes most efficient use of scarce regulatory expertise, which has a high opportunity cost, and spreads out the fixed costs associated with regulation. Centralization may also reduce the risks of destructive competition among regulatory jurisdictions and of a race to the bottom (Box 2.10). Centralization may be necessary when subnational jurisdictions are too small to encompass the efficient scale or scope of operation of particular utility industries.

Box 2.10. India: Competition Between the States

A lack of investor interest in the Haryana Power Project in 1997 was exacerbated by the fact that other Indian states were competing for a small pool of international investors. As a result, Haryana decided to provide an attractive regulatory environment, taking into account the privatization plans of other states. Part of Haryana's strategy was to reduce the financial exposure of the private sector by redesigning the privatization contract. Such an approach could certainly have adverse long-term consequences if an attractive regulatory regime for the company results in the transfer of financial risk from the private sector to the state government.

Sources: World Bank (1997),Bayliss (2001)

Regulatory decisions in some jurisdictions may have spillover effects in others; for example, effluent discharges into rivers can have implications for downstream users. Regulatory policies introduced at the subnational level can also impede interstate trade (for example, impediments caused by differing technical standards among jurisdictions), protect local monopolies, or create subsidies for local producers. These situations would call for a higher regulatory authority to protect social welfare and ensure efficiently harmonized regimes.

Finally, decentralized regulators may face a higher risk of becoming captured by industry interests or by local politicians, who are often perceived as being more populist than higher level political authorities.

Striking a Balanced

The benefits and costs of centralizing and decentralizing regulatory oversight activities cannot be determined in the abstract. Much will depend on the size of the country and its institutional structure, as well as on the technological characteristics of the particular industry (Box 2.11). Several normative conclusions can nevertheless be drawn.

Country Size. Very small countries may only one effective tier of government. Countries as large as Brazil, India, China, and the Russian Federation, however, have potential for far more decentralization and more room for debate about the allocation of roles among subnational tiers of government.

Nature of the Industries. Spillover effects associated with the alignment of jurisdiction and industry boundaries will depend in part on the nature of the industry, as illustrated for the three main utility industries:

- Electricity—Distribution utilities most closely resemble water utilities, as some operate solely within subnational boundaries. But as with water, there may be exceptions. Transmission grids are usually designed to operate nationally, and the salient characteristics of electricity generation may vary. While some assets operate solely within subnational boundaries, some investments may serve multiple subnational jurisdictions, and some generation technologies (such as hydro, coal, and nuclear) may give rise to spillovers affecting much wider jurisdictions. The increasing trend toward competition in generation may also involve cross-border trade, which may suggest benefits for regulating some issues at the national level.

Box 2.11 Russia: Regulatory Structure in the Energy Sector

The Russian Federation created the Federal Energy Commission (FEC) in 1992 and made it formally independent of other government bodies in 1994. The FEC has a mandate to regulate wholesale electricity rates and wholesale gas prices; set tariffs for the use of the transmission grid; determine prices for access to the gas pipeline by firms not associated with the dominant gas entity (Gazprom); set prices on dispatcher and other services sold by Gazprom and affiliates of the dominant electricity entity, RAO UES; and develop long-term investment priorities for the industry. Regional energy commissions (RECs) were formed at the oblast level by the regional authorities in 1991. The RECs set retail tariffs for electricity, heat, and gas within guidelines and boundaries set by the FEC. The FEC has the authority to compel the RECs, as well as enterprises, to give it information; and it serves as an appeals board for regional tariff disputes. However, the RECs are not subordinated to the FEC.

Source: **IEA, Russia Energy Survey (2002).**

Reflecting these considerations, transmission and at least some aspects of generation may be best regulated at the national level in smaller countries, while in larger countries it may be feasible to regulate distribution at a subnational level (Smith 2000a).

- Water—In most countries, responsibilities in the water sector have been extensively decentralized. Many water utilities operate solely through local networks, with limited interconnection between networks (Box 2.12). However, many other utilities serve several contiguous municipalities or draw on water resources that do not respect political boundaries. For these reasons, municipal, state, and even national governments may dispute water regulation.

Box 2.12 Mexico: Decentralization in Water and Ports

Mexico has a highly centralized governmental structure. However, several water supply functions have been decentralized. As a first step, public irrigation systems were transferred to user groups. By 1996, an area of 2.9 million hectares—representing 87 percent of the area under major and medium-level irrigation and 46 percent of the total area under all irrigation—was transferred to 386 water-user associations. Water resource management remained the responsibility of the central government, but the management of many supply tasks was transferred to local authorities.

Extensive decentralization was also undertaken at ports. In 1992, the Mexican government began relinquishing control over port administration, terminal operations, and other port services. All oversight functions were transferred to port authorities, which manage their ports in accordance with concession contracts.

Source: Saleth and Dinar (1999); Aubert and Laffont (2000).

- Telecommunications—Of the three main utility industries, telecommunications has made the most progress in introducing competition. Telecommunications networks are national (and indeed international) in reach, and major firms tend to operate on a national level. Firms based in different subnational jurisdictions should in principle be subject to consistent regulatory treatment insofar as this affects their competitive position. Reflecting this, virtually all countries locate responsibility for regulating telecommunications at the national level.

Box 2.13. Morocco: Decentralization and Functional Specialization in the Water Sector

Morocco has a strongly centralized government. However, its water sector has a highly decentralized regulatory structure, with considerable functional specialization. The Directorate General of Hydraulics under the Ministry of Equipment plans and develops the water resources. The National Office of Potable Water, under the same ministry, acquires and distributes water on a retail basis to households and industries and on a bulk-supply basis to local governments. The nine regional authorities for agricultural development, under the Ministry of Agriculture, develop and maintain water distribution networks and collect water charges. In smaller systems, local governments and farmers play a stronger role in water distribution and system maintenance.

Source: **Saleth and Dinar (1999).**

Regulatory Capacity. The more acute the constraints of regulatory capacity, the stronger the arguments for centralizing regulatory responsibility, at least at first. The potential benefits of decentralization can then be acquired through other strategies; for example, national-level regulators can tailor their approach to suit local conditions, and they can establish regional offices or adopt other mechanisms to shorten the distance to firms and other stakeholders (Box 2.13).

Regulatory Issues. Different regulatory issues may be assigned to different tiers of government. To illustrate, in a federal system, electricity distribution utilities may be regulated primarily at the state level, some technical standards may be mandated by national-level authorities, and land-use decisions may be made by municipal governments. Multitiered approaches are the norm in mature regulatory systems in large industrial countries, but they add to the complexity of establishing new arrangements in developing countries.

Horizontal Location

Even assuming that regulatory responsibilities have been assigned to a single tier of government, the question remains whether the government should establish a series of industry-specific regulatory agencies or a single agency with a broader mandate.

Potential Advantages of Industry-Specific Agencies

Establishing separate regulatory agencies for each utility industry has several advantages. Separation recognizes the unique challenges of each utility industry. Each regulator can then develop its own industry-specific expertise and focus, which may improve the quality of its regulatory decisions. Creating a series of regulatory agencies also helps to distribute the risk of institutional failure and can result in experimentation and more innovative approaches to regulatory problems.

Potential Advantages of a Single Agency with Multi-Industry Responsibilities

The potential weaknesses of establishing separate agencies at one tier of government strengthen the case for consolidating several industries under one regulator. For example, competition that increases private investment in one utility industry over another at the same tier of government may create unintended distortions—such as if the regulator for telecommunications allows higher rates of return than the power regulator.

Creating a multi-industry agency allows scarce talent (economists, accountants, lawyers), other resources, and fixed costs (such as maintaining regional offices) to be shared. Consolidation builds expertise in the cross-cutting economic issues of regulation: administration of tariff adjustment rules, introduction of competition into traditionally monopolistic industries, and management of relationships with stakeholders.

The broader responsibilities of a multi-industry agency reduce its dependence on any one industry and thus provide a potentially useful additional safeguard against capture. A multi-industry agency may also be in a better position than industry-specific agencies to resist political pressures because its broader constituency raises the stakes of political interference and gives it greater independence from sectoral ministers.

In any event, the traditional notion of distinct utility industries is itself under threat. Deregulation and evolution in business strategy have seen electricity, gas, rail, and water companies entering the telecommunications business; gas companies entering the electricity business; energy companies entering the water business; and water and electricity companies merging. A multi-industry regulator can coherently address the new and challenging issues emerging with these multi-utilities. In addition, a multi-industry regulatory agency is in a better position to guard against distortions caused by the inconsistent regulation of utilities either competing with each other directly (such as electricity and gas) or competing for investment capital (Helm 1994).

Box 2.14. Latvia: The Public Utilities Regulation Commission

Until 2001, the regulation of public utilities in Latvia was the responsibility of several institutions: the Energy Regulation Council, under the supervision of the Ministry of Economy (energy sector); the Telecommunications Tariffs Council, under the Ministry of Transportation (MoT) (telecommunications sector); the Railway Administration Department of the MoT (rail sector); and the Communications Department of the MoT (postal sector). In January 1997, the government decided to combine regulatory oversight activities in the energy, telecommunications, post, and rail sectors under a single agency. The Public Utilities Regulation Commission took over these regulatory responsibilities in October 2001. The stated rationale for this organizational change included the need for regulatory consistency across the various utility sectors; technological convergence; the blurring of industry boundaries; and the need to make efficient use of human and financial resources.

Source: **www.sprk.gov.lv**

Striking a Balance

Deciding on the breadth of the industry coverage of utility regulators involves a number of tradeoffs, given the following considerations (and no single approach will be superior in all circumstances).

Country Size. For small countries with limited financial and human resources, there is a strong argument in favor of merging regulatory

responsibilities under a single agency (Box 2.14). However, the larger the economy, the greater the possibility that the advantages of a multi-industry agency may be outweighed by concerns over insufficient industry focus and potential diseconomies of scale. In this issue, the most appropriate reference point is arguably the number of consumers, rather than the total population, as the two can be very different in developing countries. Several multi-industry agencies in fairly small economies have dealt with these challenges successfully, such as the national regulators in Costa Rica, Jamaica, and Panama and the state-level regulators in Brazil. It is not clear where the upper limit may be. The California Public Utilities Commission has responsibility for regulating power, water, gas, and aspects of telecommunications and transport in an economy with a population of more than 30 million. However, a jurisdiction of the same size may be more challenging for a less-experienced regulatory agency.

Scope of Regulatory Responsibilities. Regulatory agencies in developing countries typically have more limited discretionary authority than their counterparts in industrialized countries. In general, the narrower the scope of the agency's responsibilities in relation to any industry, the less should be the concern over inadequate industry-focus or potential diseconomies of scale with multi-industry agencies.

Nature of the Industries. The risk of economic distortions arising from inconsistent approaches to common issues may be greater where market substitution can occur between the outputs of regulated industries, most notably between electricity and gas, but potentially between various transport or communications modes as well. The case for consolidating regulatory responsibility for some industries may thus be stronger than for others. For example, fairly little controversy arises over merging of responsibilities for electricity and gas in a single energy agency. The more-monopolistic power and water industries may also share more common features than a competitive telecommunications industry does, although the advent of competition in electricity is eroding this distinction (Joskow 1998b).

Regulatory Capacity. With the acute constraints of scarce expertise and vulnerability to political and industry capture in the DTEs, the

Box 2.15 Bolivia: A Compromise between Coordination and Specialization

Bolivia's regulatory structure is a creative compromise between the industry-specific and multisectoral regulator options. The hybrid model seeks to capture the main benefits of the two options. The system has sector-specific branches, each with its own autonomous superintendent and dedicated staff. They are subject to common rules, under the supervision of a general superintendent. The structure is similar to that of a multisectoral agency with specialized bureaus, though these branches enjoy more independence. The general superintendent serves as an appeal body, with a mandate to foster coherence in the system. The hybrid approach was taken because the sectoral authorities were reluctant to cede their regulatory powers to an independent multisectoral agency.

Source: **Laffont (2002).**

arguments become stronger for a multi-industry approach. The potential benefits of industry-specific agencies can then be gained through other strategies, including the creation of industry-specific departments or cells within an overall agency (Box 2.15).

Reform Strategies. Alternative reform strategies may place different demands on newly created regulatory agencies, affecting their ability to develop and apply expertise and to maintain sufficient focus. Two main strategies might be contrasted:

- Staggered reform—Under this approach, the government reforms one utility industry after another, over a period of time. For example, it might first focus on the telecommunications industry and follow this with power and then water. This strategy would allow a newly created regulatory agency to focus initially on one industry and build up some experience. The agency might then be better prepared to assume responsibility for additional industries as they emerge from the reform process. This was the approach adopted by state-level regulatory agencies in the United States, which were initially responsible only for railways and acquired mandates for additional industries over time.
- Concurrent reform—Under a "big-bang" approach, the government seeks to privatize and reform all or most utility industries more or less simultaneously. This strategy could place significant demands on a newly created multi-industry agency. Governments intent on this strategy might give more weight to the potential advantages of creating industry-specific agencies initially and perhaps merging them subsequently. Another approach, adopted in Bolivia, is to establish a hybrid structure that captures some of the benefits of both industry-specific and broader approaches (Criales and Smith 1997).

Effective Regulation to Improve the Investment Climate

Regulatory policies designed to encourage sustained private investment in infrastructure do more than merely serve the narrow interests of investors: they also widen access to basic services and promote competition. After all, arguably the most important reason for privatizing infrastructure in the DTEs has been the public sector's inability to continue financing the maintenance, modernization, and expansion of this infrastructure. If adequate private investment does not flow into these sectors, the goals of universal service and increased access to services by the

Two pillars form the basis for the strategy of development: building an investment climate that facilitates investment and growth, and empowering poor people to participate in that growth.
Stern (2001).

poor will inevitably suffer; and if investment is stifled by restrictive regulatory policies, entry and consequently competition will not materialize.

Any lack of clarity in economic regulation and entry decisions (licenses, privatization agreements) can deter infrastructure investment. To address such concerns the regulatory agencies could issue public documents (white papers) concerning the policies and procedures that will guide their decisions in the future (see the discussion below). A perhaps more pragmatic approach would be to set up a consultative industry forum where interested operators, service providers, and potential investors could openly discuss issues affecting competition and other policy matters. Some regulatory bodies in the DTEs have adopted consultative approaches to regulation. The Telecommunications Regulatory Authority of India regularly updates its website with consultation papers and input from operators, investors, academics, policymakers, and other stakeholders. Botswana is regularly singled out for its public consultation processes. Also, Anatel, the Brazilian regulator, regularly publishes its consultation and discussion documentation electronically (Bruce and Macmillan 2002).

The Importance of Regulatory Commitment

Network utilities entail large fixed costs that are long lived and mostly sunk (that is, they have few alternative uses). When a utility is making decisions regarding the incremental costs of adding a service (or the avoidable costs of eliminating a service), given existing capacity, it typically considers only the additional costs of production imposed by that service and not the full measure of the long-run fixed costs. Because fixed costs are large, the ratio of the operating to total costs—and hence the revenue needed to cover current cash expenditures as a proportion of total costs—is much lower in infrastructure than in the other sectors of the economy.

The services delivered by the infrastructure industries are massively consumed and are regarded as essential, both to the public and for the effective functioning of the economy. Cost-based prices for many households can represent a substantial proportion of their budgets. Price changes can therefore have a considerable impact on the level and distribution of real incomes. Infrastructure services are essential intermediate inputs for other sectors of the economy, and the service levels and prices can have major effects on industrial costs and international competitiveness. Moreover, the presence of only a few utility operators in each locality raises immediate concerns about concentrated and exploitative market power, excessive prices and profits, and restricted freedom of choice. These characteristics create significant opportunities for political mobilization, consumer and special-interest-group activism, and populist manipulation (Spiller and Savedoff 1999). Cultural attitudes toward paying the full cost of these services change fairly slowly, and price increases frequently generate considerable public opposition (Box 2.16).

Box 2.16 India: Reversal of Tariff Rise in the State of Kerala

Following violent public and political opposition, the Kerala state government, in India, decided to reverse its September 2002 decision to raise tariffs by 60–100 percent. Protesters ransacked power utility offices, and the opposition called for a general strike in Kerala. The failure of the monsoon rains—which affected hydro production—and the deepening financial troubles of the Kerala State Electricity Board had prompted the government to raise tariffs.

Source: **Platts Power in Asia, 19/9/02.**

Because a large portion of the infrastructure costs are fixed and sunk, once the investment is made the utility will continue operating as long as operating revenues exceed operating costs. This motivates governments to behave opportunistically when dealing with the privatized utilities. For example, after the investment is made, the government can lower the regulated prices the utilities charge for their services, impose special taxes, disallow some of the costs, restrict procurement and employment practices, require special investments, and restrict the composition and movement of capital (Box 2.17).

If private utilities are vulnerable to administrative intervention, they can be expected to invest less than the optimal amount and to make disproportionately low investments in activities with large sunk costs, because once sunk investments are made, the balance of bargaining advantage generally shifts from the private investors to the regulator (Hart 1995). Understandably, then, the owners of private capital will be unwilling to undertake the sunk investments needed to supply the infrastructure services unless the government can credibly commit to regulatory stability—frequent

changes in the regulatory regime can have the same effect as outright expropriation of their sunk investment.

The extent of the commitment problem depends on both the country's political institutions and the nature of the technology underlying the industry's production. In sectors like telecommunications, where technology is changing rapidly, the rate of asset depreciation is high, and therefore sunk costs and the risk of expropriation will be

Box 2.17 Examples of Alleged Government Opportunistic Behavior

Hungary: Electricity Distributors Threaten Legal Action
Hungary's six electricity distribution companies (EDCs), which are majority owned by Eon and RWE of Germany and EdF of France, have threatened legal action against the government. The dispute is over tariffs that the EDCs are allowed to charge end users. The government had restricted the tariff increase to 6 percent, which was the expected inflation rate. However, actual inflation is closer to 10 percent, and the price that the EDCs pay to the state-owned electricity wholesaler, Magyar Villamos Müvek Rt., has increased by 13 percent. The companies denied allegations that they made excessive profits under the pricing regime in force from 1996 to 2000 and claimed that their average return on equity had been only 7.8 percent, below the 8 percent promised under the privatization agreement. In the week following the government's decision, the share prices of the two largest distribution companies, Elmu and Edasz, fell 15 percent on the Budapest stock exchange.

Source: Financial Times, 7/2/01.

Argentine: Electricity Regulator Cuts Penalty for Failure to Pay Bills on Time
The National Electricity Regulatory Authority in Argentina (ENRE, Ente Nacional Regulador de la Electricidad) ordered the distribution companies—Edenor, Edesur and Edelap—to reduce the penalty for failure to pay electricity bills on time from 10 percent to 1.2 percent. The distribution companies said that this order changes the agreed rules and they feared that ENRE would try to change its other agreements with the industry.
Source: El Clarin, 8/6/99.

Ghana: A New Telecommunications Tax
In January 2002, the Accra Metropolitan Assembly (AMA) imposed a new tax of 50,000 cedi per mobile telephone subscriber and 20,000 cedi per fixed line subscriber in Ghana.<Author: add (8,569.40 cedi = US$1.00)?> The dominant mobile operator, Scancom Ltd. (Spacefon), estimated that this tax would increase its costs by $1 million per year. In December 2002, the AMA sealed the offices of the two mobile operators, Millicom Ghana and Scancom, because of their failure to pay these taxes. Workers and customers that came to transact business with the companies were prevented from entering the offices. Subsequently, the companies filed a writ challenging the legality of AMA's new tax.

Source: Haggarty and Shirley (2002).

Kazakhstan: The Government Reverses the Tariff Policy
In 1996 Tractebel—a wholly owned subsidiary of Suez Lyonnaise—acquired Almaty Power Consolidated, the producer and distributor of electricity and heat in Almaty, the former capital of Kazakhstan. The government promised to raise tariffs in return for an investment of $300 million by Tractebel in the distribution company. The nationalist government that took office in 1997 reversed previous policies and refused to allow the tariff increases. When Tractebel claimed breach of contract, it became the target of demonstrations. The row over tariffs contributed to the eventual withdrawal of Tractebel from the market and the return of the assets to state ownership in November 2000.

Source: Bayliss (2001).

Ecuador: The Leading Private Utility Sues Government
In 1992 Empresa Eléctrica del Ecuador (Emelec) was awarded $51.9 million in international arbitration because for a decade the government had refused to set rates that would allow Emelec to achieve the contractually guaranteed 9.5-percent rate of return on its investment. The government refused to pay the award, and in 1995 Emelec sued the government to abide by the arbitration decision. The 1995 lawsuit prompted the government to agree to a settlement. However, in a lawsuit filed in July 1999, Emelec sought substantial additional damages because it alleged that the government had failed to honor its obligations under the 1995 settlement. Despite the fact that Emelec has had its position vindicated by at least three tribunals and the Ecuadorian courts (up to the supreme court), the government has steadfastly refused to honor its contractual obligations to the private company.

Source: PR NEWSWIRE Reuter, 7/14/99.

correspondingly low. By contrast, the commitment problem can be severe in the water sector, where assets depreciate slowly. The risk of expropriation is high as well in countries where the government's formal or informal regulatory procedures are weak or absent, the judiciary has little authority or capacity to review administrative decisions, and elections are frequent, highly contested, and dominated by well-organized constituencies (Spiller 1992).

Opportunistic behavior is not the exclusive domain of the government. Some firms also behave opportunistically, and the outcome of such behavior crucially depends on the relative bargaining power of the regulated firm and the regulator (or the country). A major imbalance in bargaining power can occur when low-income developing countries are dealing with large foreign investors and multinational corporations. Private investors could demand post-privatization tariff and contract adjustments in their favor, and countries might cave in because of their critical need for foreign investment and because any legal action, regardless of its merit and eventual outcome, might result in caution among all foreign investors.

Getting the Economics Right

Much of the discussion of infrastructure reform in the DTEs has properly focused on the institutional foundations of regulatory effectiveness and nondiscretionary governance. Clearly, the establishment of institutional mechanisms that impose restraints on arbitrary administrative intervention would signal to potential investors that the value they add to infrastructure will not be expropriated. This type of commitment, which flows from the country's legal and regulatory systems, reduces investment risk and consequently the discount rate applied to net present value and cash flow calculations.

The fundamental sector economics must be right for any business investment plan to be feasible. After all, a pricing policy that does not allow adequate revenue, even if transparently implemented by an independent regulator, will still repel investors. For example, as of 2000, in almost all CIS (Commonwealth of Independent States) countries, household electricity prices covered less than 50 percent and industrial prices less than 70 percent of long-run marginal costs (von Hirschausen and Opitz, 2000). It would be difficult to imagine that even a truly independent and transparent regulatory regime would be able to facilitate private investment under those pricing conditions.

Similarly, a regulatory regime that interferes with competitiveness by disallowing flexible prices and terms or by imposing social service obligations on only some of the competitors will not

promote efficient investment, even when institutional mechanisms provide a credible commitment to policy stability. Thus, the mantra of international advisers that stresses the importance of institution building and regulatory independence is far from sufficient. Especially given the extraordinarily adverse financing climate, in this second stage of the reform process it is imperative that policymakers in the DTEs focus on the substantive content of regulation, to create an economically attractive investment environment for investors.

Perhaps the single most important element of an investment-oriented policy is pricing reform. A key priority in attracting private investment is moving to cost-reflective tariffs, which would permit the privatized operators to earn enough revenue to compete equally with firms elsewhere in the economy for available financing to maintain, replace, modernize, and, where appropriate, expand their facilities and services. The interests of users and the economy can be better served if the privatized operators are not unduly constrained by price controls that no longer reflect the competitive realities in these markets. The operators should be accorded pricing flexibility without leaving the way open to either cross-subsidization or monopolistic pricing.

Regulatory Commitment through Concession Contracts

In some infrastructure sectors (telecommunications, electricity generation, and gas production), ownership was transferred to the private sector through outright divestiture. In others (water and sewerage, transport, the transmission and distribution components of electricity, and the transportation and distribution components of gas), legal, political, and constitutional restraints have hindered the outright transfer of ownership to the private sector. Instead, many countries have devised innovative strategies to facilitate private sector participation in those sectors (Table 2.5). Concessions or franchise agreements and, to much lesser extent, management contracts have emerged as attractive alternatives to outright privatization (Guasch, Kartacheva, and Quesada 2000).

A concession contract grants a private company, typically through competitive bidding, the exclusive right to provide a service for a specified period by using existing facilities and developing new ones. The contract defines the obligations (in terms of service rollout and performance standards) and rights of the concessionaires and the incentives and risks under which they operate, including pricing arrangements (Klein 1998a). By establishing an explicit contractual relationship, concessions place limits on the discretionary powers of the government and can reduce the risk of political expropriation. Contracts that also include certain regulatory principles (for example, the

basis for revising tariffs and that for settling disputes) can minimize the need for discretionary decisions after the fact, thus providing some protection against regulatory opportunism (Crampes and Estache 1998; Stern and Holder 1999). If the concessions are granted through competitive bidding, they ought to contribute to allocative and productive efficiency, and the periodic re-auctioning of concessions would create competition for the market. With well-written concession contracts and rebidding, the practice of periodic re-auctioning could effectively solve the natural-monopoly problem (Demsetz 1968, Klein 1998b).

Table 2.5 Concessions in Selected DTEs

Telecom (wireline voice)	Electric power (generation)	Gas (transport and distribution)	Railways Mainly franchising	Water (distribution)
China, Cook Islands, Guinea-Bissau, Hungary, Indonesia, Madagascar, Mexico	China, Côte d'Ivoire, Guinea, Hungary, Mexico	Argentina	Argentina, Brazil, Côte d'Ivoire Burkina Faso, Chile, México	Argentina, Brazil, Chile, China, Colombia, Côte d'Ivoire, Guinea, Hungary, Macao, Malaysia, Mexico, Senegal

One of the main challenges of infrastructure concessions is writing time-consistent, enforceable contracts that cover all the contingencies that might arise with such technically complex activities and economic uncertainty. Frequently, assumptions that seemed reasonable when planners developed the key economic parameters of a contract have proven highly inaccurate after the fact. Thus, allowing some room for renegotiation and regulatory adaptation may seem appropriate and socially desirable in the face of new problems, changed circumstances, and additional information and experience. However, contractual incompleteness could lead to opportunistic renegotiation. In industrial countries, such renegotiation is not a big concern, though, because adherence to contracts can be enforced by high-quality institutions (Laffont and Tirole 1993). The absence of such institutional mechanisms in the DTEs makes renegotiation a serious public policy issue.

Using explicit long-term contracts as a substitute for separate regulatory institutions is likely to be problematic. Without an independent mediating regulator, any adaptations would have to be renegotiated with the government, and this would increase the risk of harmful political interference. If, however, concessions are lodged within a separate regulatory framework that defines the basis and criteria for contract revision, socially desirable, dynamic adaptations would be feasible and less likely to place significant strain on concessions facing uncertain economic conditions. This would apply to concession contracts for roads and railroads, for example, as demand for such services is subject to large fluctuations, and cost estimates are frequently inaccurate.

Since the late 1980s many concessions have been awarded to private infrastructure operators throughout the world; in the Latin America and Caribbean region alone, more than 1,000 concession contracts have been signed. Despite its early promise, however, this form of private sector participation has often produced mixed results. Serious doubts have arisen about its efficacy, and there have been acrimonious disputes over contract compliance, complaints about excessive tariffs, frequent bankruptcy claims by the concessionaires, poor service delivery, and in particular, opportunistic renegotiation. Excluding telecommunications, more than 40 percent of concessions are renegotiated before they expire, and 60 percent of these are renegotiated within three years, despite contractual periods of 15–20 years (Guasch 2001). As noted above, some occasional renegotiation can be for the good. However, the excessive proportion of renegotiated contracts (more than 80 percent in the water and transport sectors) and the early renegotiations (less than three years into the contract, on average) strongly suggest opportunistic behavior and seriously flawed regulatory design.

Early and frequent renegotiation affects sector performance; it also undermines the credibility of the process and the reputation of the country, especially when the renegotiation favors the operator, as is often the case. A bidder who knows that early renegotiation is possible may submit a low-ball bid, with a view to renegotiating better terms, without competition, shortly after securing the concession; and that bid might be accepted, irrespective of efficiency or value.

Recent empirical work suggests that the high incidence of concession renegotiation can be attributed to politics, weak regulatory governance, and flawed contract design (Guasch, Laffont, and Straub 2002). Setting up a separate regulatory body appears to significantly reduce renegotiations. Contingencies occurring during the lifetime of the concession can then be dealt with through the normal revision process inside the regulatory framework, reducing the need for disruptive

renegotiation. Having a regulatory body can also signal a commitment to enforcement and may signify experience in dealing with complex design issues and contracts. There is also evidence that price caps are conducive to renegotiation, perhaps because, relative to cost-plus rules, price caps shift more of the risk from consumers to the operating entities. This finding is especially important for policy in Latin America, where price caps regulate 75 percent of concessions.

As a result of political-economic factors, renegotiations often favor the operators. Once a concession is awarded, the government typically claims it is a great success and points out the large amounts of promised investment. Rejecting a request from the operator to renegotiate soon after the concession is awarded may result in abandonment or suspension of the concession, which could be seen as a failure and might require the issuance of a new concession, at potentially large transaction cost. Confronted with this dilemma, governments usually concede, demonstrating the leverage of the incumbent operator.

Commitment Versus Flexibility in Regulatory Architecture

A good regulatory system must be responsive to changes in demand and supply, in industry technology, and in the competitiveness of the directly regulated and adjacent markets. If the system is to provide incentives for efficient performance, it must be able to adapt its mandates and rules in response to new problems, circumstances, information, and experience. Such flexibility is especially imperative in sectors experiencing rapid technological and market changes.

The goal of regulatory dynamics argues in favor of putting discretion in the hands of well-intentioned and skilled regulators. Still, discretion can be misused, whether by government (to advance short-term political goals) or by regulators (to benefit themselves). The owners of sunk assets under regulatory control may see such discretion as a mortal threat. The value of investment in those assets can be destroyed by aggressive regulation that disallows revenues beyond those needed to recover short-run variable costs. The fear that regulatory discretion might result in the expropriation of private assets would predictably override any incentives to invest in the market.

Where concern over the misuse of regulatory flexibility is significant, the government can reduce discretionary power by introducing rigid and specific rules. For example, Chile introduced a law with detailed rules that significantly reduced the scope for regulatory opportunism in the electricity sector (Spiller and Martorell 1996). However, the resulting rigidity completely undermined the

ability of the regulatory body to creatively adapt to market changes (Box 2.18). Such a solution therefore generates new and substantial risks for the public interest. Actual or perceived regulatory risk can also be reduced substantially if the privatization or concession agreement stipulates the regulations in great detail. Indeed, tight privatization contracts are now common in many developing countries.

A proper balance between regulatory flexibility and commitment is a precondition for attracting sustainable private investment. But a more creative solution is needed to appropriately limit regulatory discretion while avoiding the rigidity and paralysis of micromanaged privatization or concessions. Willig (1999) proposed a process for limiting the government's discretionary powers in a socially desirable way: the regulatory body publicly sets out the fundamental economic principles that it will use as the basis for its policy analysis and decisions. These economic principles could be included in a statute or a concession agreement and should be the continuing guidepost for ongoing postprivatization governance. They must cover issues ranging from safeguarding the value of investments in infrastructure (without going so far as to shield investors from market-driven risks) to consumer protection and tariff-setting processes (Box 2.19).

Box 2.18. Chile: Regulatory Rigidity

Chile introduced a new electricity law in 1981–1982 to assure potential investors that the regulator would not expropriate their investment. The power to make decisions was therefore taken away from regulators and embedded in law. The law was therefore extremely comprehensive and complex, incorporating details normally left to regulatory determination. At the time, this revolutionary approach seemed a good bargain: in the early 1980s, Chile needed to convince investors that the rules of the game would not change according to regulatory whim. This mechanism attracted investment when the sectors were eventually privatized, but it had the undesirable effect of making the regulatory regime rigid and unadaptable.

The system's inflexibility could become quite costly when the environment changed, as shown by the 1998–1999 drought. During that crisis, the whole governance system collapsed, and the country was subjected to avoidable and prolonged blackouts, without any compensation to users. This caused an estimated $300 million in damages to the economy. The failure of regulatory governance during the crisis was due in part to the lack of flexibility embedded in law, which reduced the ability of the regulator to respond quickly to the drought.

Source: Fischer and Serra (2000).

Mechanisms to Regulate Prices

Regulators must typically strive to achieve a multiplicity of explicit or implicit goals in the face of numerous constraints. These goals include (Joskow 1998b) the following:

- Rent extraction—Setting just and reasonable rates that strike a socially acceptable compromise between the interests of investors and those of consumers.
- Supply-side efficiency—Providing signals and incentives for suppliers and investors to improve efficiency

- Demand-side efficiency—Providing signals and incentives for efficient consumption of regulated utility services
- Revenue adequacy—Allowing the regulated firm to earn revenue just sufficient to attract the capital needed for maintenance, replacement, modernization, and whatever expansion is justified by demand for the service
- Fair income distribution—Ensuring income distribution that accords with society's conception of justice.

Two alternative mechanisms for regulating prices are cost-plus and price caps. In this section, we discuss and compare these approaches and their likely implications for tariff policies.

Box 2.19. Guiding Principles for Public Utility Regulation

Preserve the value of investments at a baseline established in the privatization agreement
Allow competition to function without distortion
Weigh the costs of regulatory mandates and rules against the benefits
Ensure competitive service quality and price levels
Ensure that prices provide signals and incentives for consumers, suppliers, and investors to be efficient
Open access to bottleneck facilities on terms that reflect competitive parity
Attend to social goals without influencing competitive advantage

Source: Willig (1999).

Cost-Plus Regulation

Until recently, cost-plus (or rate-of-return) regulation predominated in the utility industries of the United States and several other countries. Policymakers have been attracted to this mode of controlling the behavior of utilities, because conceptually it seems fair to both the regulated firm and its customers. It permits the firm to earn sufficient revenues to cover its costs, including a fair after-tax return on its investment, by passing these costs on through the prices charged to consumers. It is also designed to protect consumers from monopolistic pricing distortions.

Cost-plus systems have several shortcomings. The firm has an incentive to engage in accounting contrivances and to pad its costs to convince the regulator to approve a higher price to the consumer. These systems allow considerable scope for this: the conventions for calculating depreciation, the procedures for allocating joint costs between regulated and nonregulated outputs, and the procedures for calculating capital costs all admit a range of estimates. Unless the regulatory body has the expertise to audit the firm's actual costs, the firm can get away with misrepresenting its costs. This will lead the regulator to set prices that are too high, thus frustrating its rent extraction goal. Moreover, the firm has weak incentives to keep its real costs down by being more efficient and innovative, as this form of regulation fails to distinguish earnings attributable to efficiency and those

attributable to the exercise of market power. Also, the firm has incentives to expand its rate base by adopting an excessively capital-intensive technology (the Averch-Johnson effect). These features of cost-plus systems clearly conflict with the goal of supply-side efficiency.

One of the attractions of cost-plus systems is that they are likely to attract capital investment to the regulated sector, because investors know they will recover their operating and investment costs, perhaps with a return exceeding their cost of capital. Cost-plus systems effectively shift a variety of firm- and market-specific risks from the regulated firm to the consumers (Joskow 1998b). Thus, the goal of revenue adequacy is easily satisfied. By holding revenues close to costs, cost-plus systems keep utility services reasonably affordable. These are important considerations, given the socioeconomic characteristics of many DTEs and their generally substantial requirements for investment in infrastructure.

The pure cost-plus system (whereby prices are continuously tied to accounting costs) is largely a straw man today, and no one would deliberately choose it for the public interest. But perhaps it has gotten a worse reputation than it actually deserves. In practice, under rate-of-return regulation (a variant of cost-plus), prices are set in public hearings that evaluate cost data on the basis of specific accounting criteria. Once set, prices remain fixed until they are reviewed by the regulator again. This regulatory lag should be viewed as an advantage, because it restores some of the incentives for efficiency that are lost under a pure cost-plus system. Freezing prices for the period of the lag imposes penalties for inefficiency and wrong guesses, while it rewards efficiency by permitting the firm to keep the profits it reaps from superior performance. Similar benefits are obtained if the regulator restricts profits to within a range or zone of reasonableness, allowing adjustments in prices only when returns fall outside that range (Kahn 1988).

Price-Cap Regulation

Price caps are designed to protect consumers by limiting the prices that a firm with market power can charge. At the same time, they offer the firm wide freedom to make decisions. Aggregate index ceilings are placed on prespecified groups of services, called baskets. The regulated entity can freely set the price of any service, so long as it violates no index ceiling constraint. Index ceilings are adjusted during periodic reviews to allow for expected cost inflation (easily observable changes in costs, generally beyond the entity's control) and a precommitted rate of productivity improvement (the *X* factor). The price-cap system allows no transfers from the regulator to the regulated firm. In

fact, the main instrument available to the regulator is the price, or more accurately, the rate of increase of the price index, and so it cannot offer an optimal solution to the incentive compatibility problem discussed in the incentive regulation literature (Laffont 2001, 2002). Nevertheless, in the set of practicable regulatory systems, it is regarded as having desirable properties.

In principle, the regulator is not supposed to intervene in the pricing decisions of the enterprise within the review period. This implies that the firm has an incentive to reduce its costs at a faster rate than was envisaged when the value of *X* was set, because it can keep the resulting profits. It also implies a tradeoff in setting the length of the review period: the longer the period, the greater the benefits for the firm; the shorter the period, the greater the benefits for the consumer (because consumers do not benefit from these cost reductions until the price cap is reset). As well, it implies that the regulator, when setting the price cap, has to forecast future costs and revenues, to ensure that the firm will be financially sustainable, at least with a probability that is acceptable to the firm beforehand. The source of information for this exercise is of course the firm itself, and so this system does not entirely escape the problems related to rate-of-return regulation. There are grounds for expecting a ratcheting-up effect in the price-cap system: as the end of the review period approaches, the firm will ease off in its cost-reducing activities so that the reset caps will reflects its higher cost levels.

Various choices are available to the regulator: Which services will be subject to a price cap? Which services will be used to construct the price index? Will certain cost increases be automatically passed on to the consumer, and if so, to what extent? Different utilities will require different detailed designs, so the introduction of price-cap regulation can be costly in terms of information requirements and human capital. Nevertheless, the price-cap system is sufficiently superior to rate-of-return regulation, in terms of both incentives for cost reduction and ongoing regulatory costs, to be worth the set-up costs.

Comparative Information Requirements

Cost-Plus. Given typical inflation rates, regulatory hearings would be an ongoing process. The costs of information and of regulatory proceedings will be high.

Price Cap. Similar information as for cost-plus, together with forecasts of the relevant variables over the future review period, is required at the end of each review period. However, for typical review periods of 3–5 years, this is likely to imply a substantially lower total information

requirement. Within review periods, the regulator needs only to monitor compliance with the price-cap regime.

Comparative Human Capital Implications

Cost-Plus. For information collection, processing, and presentation in rate hearings a firm requires accountants, engineers, economists, and lawyers on an ongoing basis. Similar professionals are required by the regulatory agency. These are of course scarce in developing countries and would have high opportunity costs, owing to the loss of their involvement in actually running the utility.

Price Cap. The process of setting price caps requires the same types of professionals as the cost-plus system. However, the within-period monitoring requires far less professional input because it involves just a comparison of actual and permitted rates of increase of a well-defined price index. Thus, within periods the utility professionals would be available to run the business. Additional inputs required by the utility and the regulator when the price cap is being reset could be determined by consultants.

Comparative Risks of Capture

Cost-Plus. The incentive for capture in the cost-plus system is high, because the regulatory agency has a lot of discretion. Capture (which of course is a type of corruption) seems to have been quite prevalent in the U.S. regulatory system. It could also be expected to be high in developing countries.

Price Cap. There is also of course a strong incentive for capture under the price-cap system, but the possibility of it could be made less than under cost-plus, first, by limiting the discretion of the regulatory agency to intervene within the review period; and second, by using one-off consultants for setting future price caps.

Comparative Risks of Political Intervention

Political intervention has been a major problem with the operation of utilities as public enterprises in developing economies (and not only those; compare, for example, Italy) and will probably continue to be so. The *World Development Report 1994: Infrastructure for Development* argued that establishing the utilities as commercial enterprises and giving them autonomy within a framework of clear targets and accountability would contribute greatly to their economic performance, as well as to the economy as a whole. That is surely right. It could further be argued that having them

regulated by outside regulatory agencies, rather than government departments, would contribute to transparency and would establish an arm's-length relationship in their dealings with government. That said, it is not clear that a case can be made on political grounds for one type of regulation over the other. The more frequent regulatory hearings in the cost-plus system present more opportunities for intervention. On the other hand, developments within a review period in the price-cap system (for example, high profitability because the utility is more successful than expected in cutting costs) could also provide populist politicians with irresistible grounds for intervention.

Incentive Regulation

A theory known as incentive regulation provides important insights into the design of regulatory systems, but it does not supply a specific regulatory framework that can be implemented immediately (Laffont and Tirole 2000).

Incentive regulation refers to the implementation of rules that grant a regulated firm some, but not complete, discretion and encourage it to achieve desired goals. Regulation becomes essentially a principal–agent problem. If the regulator's information about all aspects of the regulatory environment is as good as the firm's, then there is no problem: the regulator (the principal) can simply instruct the firm (the agent) to implement the efficient rules. If the firm's costs are endogenous (that is, it can reduce production costs by incurring other costs—managerial effort, for example), then the regulator can specify that the firm undertake the optimal level of this activity (that is, the marginal benefit, in terms of cost reduction, is just equal to its marginal cost). The regulatory problem is, however, essentially one of asymmetric information: the regulator does not have the information it needs to implement the efficient policies, but it knows the firm does. Thus, a mechanism is needed to motivate the firm to use its superior information to achieve certain goals.

Three key assumptions underlie incentive regulation. First, the regulator is able to make money transfers to the firm. This means the regulator has an instrument, in addition to the price (or equivalently, output), to solve the adverse selection problem arising out of the information asymmetry. Second, the regulator places a higher weight on consumer's surplus than on producer's surplus. Third, as is usual in discussions of pricing, if the regulator's concern is the sum of these surpluses and not the values of its components, the adverse selection problem can be made to disappear. By offering the firm a transfer that gives it the same net profit whatever the information it reveals, the firm has no incentive to provide false information, and efficient pricing and cost-

reducing policies can be implemented. This can, however, leave the firm with large rents and is not optimal if the regulator places a higher weight on consumer's surplus than on producer's surplus. In that case, rent extraction becomes an objective of regulatory policy.

The literature developing this approach is large and sophisticated, but the question remains: What does it all imply for utility regulation in practice, especially in the DTEs? The general answer seems to be that its contribution is not to supply a specific regulatory framework or process to be implemented immediately but to give insights and ideas that can be taken into account in the design of any actual system:

- The regulatory system should give regulated firms incentives to supply accurate information but should place constraints on how this information can be used.
- The regulatory system should give regulated firms incentives to reduce costs.
- Cost increases should not automatically be passed on to consumers when firms can influence the size of those increases, but the firm should not be penalized for cost changes outside its control.
- The regulator should commit to a policy of never taking advantage of a firm's sunk costs after the fact or of revealed information.

Toward More Promising Regulatory Mechanisms

The task of designing effective regulatory mechanisms in the DTEs is especially daunting for several reasons. Some of the difficulties are endemic to infrastructure regulation everywhere, and some are oddly shaped shadows cast by the stubborn complexities of underdevelopment (see Box 2.1).

In the face of scarce technical expertise, severe information problems, lack of well-developed accounting and auditing systems, weak separation of powers, lack of checks and balances, weak legal systems, high incidence of corruption, and low levels of commitment, the U.S.–U.K. regulation models are likely to prove too challenging for many DTEs. Most developing countries are ill-suited to the traditional quasi-judicial, command-and-control techniques of regulation, with their elaborate and complex procedural requirements. More appropriate regulatory mechanisms for most DTEs would

- be simple, decentralized, flexible, and less formal
- effectively streamline procedures
- empower consumers with information

- generate creative, win–win outcomes through collaborative processes that bring all the stakeholders to the table.

Radical Competitive Restructuring

Undeveloped administrative and regulatory capacity, scarcity of technical expertise, and political interference substantially raise the risk of regulatory failure in the DTEs. This situation calls for a aggressive program of competitive restructuring and market liberalization, introduced to the fullest extent permitted by each industry's underlying economic and technological characteristics and the small size of the markets in some developing countries. The regulators must accept an ordinance that prevents them from intervening in the regulated firm's activities that relate to competitive or contestable markets. Under this principle, competitive restructuring would minimize the domain of regulatory interference and substantially reduce the need for scarce expertise and regulatory capacity. Elegantly simple regulatory systems that take into account the severe information problems and limited technical expertise in the DTEs and use the most basic, even if not most efficient, instruments of intervention are more likely to succeed. The proposed approach would require much greater attention to the fundamental sector economics early in the reform process.

Decentralizing Decisions to the Firms

The pursuit of pricing and other regulations to elicit optimal industrial performance in many DTEs is hindered by the lack of proper accounting systems and by the dearth of information on marginal costs, demand elasticities, and other pertinent attributes of demand and cost relationships. Under the traditional command-and-control regulatory model, any prices calculated without such information are apt to be inconsistent with economic efficiency and be damaging to economic welfare. The information available to the firms themselves is also highly imperfect in many DTEs. Still, it seems likely that the firms will have better and more up-to-date estimates of cost and demand conditions than the regulators (Baumol and Sidak 1994).

How can regulators in the DTEs acquire a realistic chance of becoming effective in the face of severe information problems? One promising policy direction would be to decentralize the decisions on pricing and other key variables to the firms that have the necessary information. The role of the regulator would be limited to imposing floors and ceilings on prices (to protect against predation and monopolistic pricing). The bounding magnitudes would be based, in a rough and ready way, on

economic analysis of costs or appropriate international benchmarks. The price-determining process then would be left to the firm, which would be free to select prices within the floor–ceiling limits; the firm's self-interest would motivate it to adopt prices that best serve the public interest. Such a framework could meet the dual regulatory objectives of giving the infrastructure entities an opportunity to obtain adequate revenue (an important issue in many sectors in the DTEs) and protecting consumers from monopolistic pricing.

Bottom-up Regulation through Information and Negotiation

The primary objective of the traditional command-and-control regulatory system is to protect consumers from monopoly abuse, while respecting the property rights of firms. However, as competition enters utility markets, consumers should no longer be considered helpless pawns of infrastructure monopolies. With the spread of competition, consumers will be better able to protect themselves against monopolistic exploitation, and the public interest will be well served by informed negotiations or public debates between utility suppliers and consumers. The regulatory body could play a constructive role in such deal-making by empowering consumers with information, in lieu of limiting the power of utility monopolies. Indeed, if properly constituted, the provision of information may create an effective system of self-regulation (Willig 1999; Wirick 1999).

The enormous financing needs of most infrastructure sectors in the DTEs and the extraordinarily adverse climate for generating such financing at the present time urgently call for a new creative partnership between private enterprise and the public. However, when state-owned utilities are transferred to private ownership, they often find themselves suspect. Their goals are generally taken to be the exploitation of the public and the subversion of competition, and they are widely judged to have the power to attain those goals. Thus, the regulators frequently have an adversarial relationship with the privatized utilities. As well, the traditional regulatory culture has often viewed utility policy as a zero-sum game, and this regulatory culture is unsuitable for most DTEs, in view of their unique investment requirements.

Foreign private investors weigh a wide range of generic and regulatory-specific risks in assessing investment opportunities in the DTEs. Regulatory-specific risks include lack of clarity on end-user and access pricing policy, uncertainties about the timing and scope of market liberalization, and burdens related to universal service goals. The lack of historical precedents and policy experience in

the DTEs, owing to their legacies of state ownership, exacerbates investors' anxiety. There is a need for a process that

- encourages participation, debate, and open discussion
- facilitates exchange of information and benchmarking experiences
- develops long-term relations with stakeholders, based on mutual trust and commitment to public policy outcomes
- makes it easier for regulators to consult with industry participants
- builds operators and investors into the regulatory process itself.

The privatization of utilities in the DTEs creates consumer expectations for improved services and fair prices. This naturally leads to disputes between consumers and operators, as well as between the incumbent operators, new entrants, and other service providers. Such conflicts between competitors are inevitable and healthy. However, excessive litigiousness and prolonged delays in resolving disputes can seriously impair commercial markets. The regulatory body could help the parties reach negotiated settlements and could resolve such disputes in a timely manner. When the regulatory body regulates by negotiation, however, it must ensure that the public interest is protected in these negotiations. Unless the process includes the public interest, there is a risk that in acting as a platform for negotiations among competing suppliers the regulatory body might become a venue for chilling competition (Willig 1999). Still, by allowing contesting parties to reach voluntary, uncoerced agreements, these consultative mechanisms could generate creative, win–win outcomes and overturn unduly combative relationships between stakeholders in the regulatory environment (Wirick 1999). Some of the DTEs are hostile to international arbitration, though not to consensual methods of dispute resolution; and corruption is endemic to their official administrative mechanisms. In these countries there might be considerable scope for private dispute-resolution mechanisms (Bruce and Marriott 2002).

CHAPTER THREE

Private Participation in Transportation

Throughout the world, the transportation sector has been one of the most extensively regulated sectors. Price, entry, exit, financial structure, accounting methods, vertical relations, and operating rules have all been subject to some form of governmental control. In recent years, however, the restrictions placed on competition and ownership in this sector have been viewed as inimical to consumer and industry interests alike. Following the deregulation of airlines, trucking, and railroads in the United States in the late 1970s and early 1980s, many other advanced industrial economies reviewed their regulatory policies in the transportation sector and liberalized their transportation systems. Many developing and transition economies (DTEs), facing serious fiscal pressures and poorly performing state-owned enterprises, also undertook substantive policy reforms and sought to realign the private and public sectors' roles in transportation (Estache and de Rus 2000).

Much of the recent experience and analysis in infrastructure deregulation and privatization has related to the traditional natural-monopoly network utilities. This chapter is concerned with the exercise of social control over privately provided transport infrastructure and services. It focuses on railroads and ports, two areas in which the private sector has recently begun to play a large role in a large number of DTEs. The chapter identifies distinguishing characteristics of the transport sector that have determined the forms of private participation, and it looks at the implication of these characteristics and industry forms for regulation.

Distinguishing Characteristics of the Transport Sector

Historically, state agencies directly provided much of the transport sector infrastructure and services in many countries (Shalizi 1996). Rail transport, for example, was seen as a natural monopoly; in other parts of the transport sector, direct public provision was related to special modal characteristics. Private participation in the sector, and the need for residual regulation, has to be structured to reflect these special characteristics, the main categories of which are described below.

Social Objectives

Many governments have traditionally treated passenger transport as a merit good: that is, a minimum provision of this good has been seen as a social imperative. For the most part this philosophy has been applied to local transport (though in maintaining low railway passenger fares and forced cross-subsidy of air services to the remoter regions, the Indian government has applied it more broadly). Social objectives have tended to apply to local bus and passenger rail services but not to intercity or international transportation.

Three major instruments have been used to support this policy: general control of fares, obligations to carry particular categories of passenger at concessionary rates, and obligations to maintain unremunerative services. In richer countries, these obligations have been directly financed through government payments to operators. In most developing countries, in the absence of direct financing they have been supported by internal cross-subsidy. None of these obligations could be sustained in a competitive private market (because competition would eliminate the sources of cross-subsidy). Thus, any residual commitment to them in developing countries constrains the forms of competition and regulation. This gives the role of internal cross-subsidy a particular importance in the transport sector.

Separation of Infrastructure and Operations

Unlike most public utilities, in transport (except rail) the provision of infrastructure has historically been separate from the provision of services on that infrastructure. Neither in sea nor in air transport has this created any great problems: although port and airport charges are subject to regulatory control, they are usually nondiscriminatory and do not significantly distort competition between modes or locations.

The most controversial issues have arisen in road and rail transport and in the relationship between the two. In most cases road users do not pay direct charges. Taxes on road-user inputs (particularly fuel, and to a lesser extent vehicles) are controversial in terms of modal split (rail operators claim they are disadvantaged because road users have free use of infrastructure) and choice of vehicle technology (diesel tax versus gasoline tax, different license duties, etc.). Attempts to introduce competition in rail service by separating infrastructure and operations are complicated by serious problems in determining access charges.

Product Heterogeneity

Transport demand is spatially and temporally specific; that is, it is demand for a trip between a given origin and destination at a given time. While clearly some substitutability of both trip destinations and timings can occur, any unit of supply (in the passenger market, at least) is likely to bundle a wide range of diverse products. Forecasting demand for any particular transport service or infrastructure is especially difficult and must take into account a wide range of potential substitutions. Private suppliers of transport infrastructure are therefore likely to perceive market risk as high.

On the supply side the product is also heterogeneous, with possible differences in timing, frequency, speed, comfort, reliability, and safety to reckon with. Moreover, some product mixes are difficult to sustain (for example, passenger and freight rail services on congested lines). While an individual supplier may use product differentiation and price discrimination to exploit consumer surpluses and increase revenue yields (as exemplified by the air transport market), it is common for dominant suppliers to seek protection against competition from new, differentiated entrants (particularly in the urban passenger transport market). Because of inefficient road pricing (owing to congestion externalities), the regulation of competition has been particularly difficult and contentious.

Externalities

The two major externalities that affect the transport sector are environmental impacts and traffic congestion.

Regulation must protect the environment from the effects of the transport sector. This sector is responsible for about 25 percent of greenhouse gas emissions in the richest countries and for as much as 80 percent of health-damaging suspended particulate matter in many megacities. Direct interventions have been undertaken to suppress some types of emission at source (elimination of lead from gasoline, mandatory use of catalytic converters on road vehicles, noise regulations on aircraft, regulations on ship discharges). Indirect interventions have taken the form of measures to discriminate between more and less polluting modes to reduce the overall environmental impact of the transport sector (Shalizi and Carbajo1994, Gwilliam, Shalizi and Thompson 1994).

Congestion occurs where the addition of one user to the flow of traffic adversely affects the performance of other users. It is a particular problem for road traffic in urban areas, and it also

affects the performance of major ports and airports. In rail systems, overall performance is highly sensitive to the mix and management of flows of fast passenger and slower freight trains. Congestion has implications for optimum prices, which are not always easy to reconcile with commercial operations, especially where infrastructure and operations are separated. And where, as is usually the case, urban road use is not optimally priced, it generates calls for second-best physical interventions, which may restrain competitive entry (for example, the current resistance to using small buses and vans to provide services in Argentina and Brazil).

Information Inadequacy: The Costs of Shopping Around

Because passenger demand is heterogeneous and services are speculatively bundled to capture this demand, transport users often face significant information costs in identifying how best to satisfy their needs. For some repetitive trips—for example, the peak-hour journey to work—the passenger is probably well informed. For other trips, off peak or occasional, the passenger may have limited experience. In a fragmented, competitive market, transport users have no central source of information to rely on. It may be in the interests of a new entrant to run just ahead of the known schedule of the incumbent, and it then becomes in the interest of the incumbent to hang back a little to allow passengers to congregate. Such irregularity of service may also be caused by bunching of buses on congested roads. Even if passengers prefer to use buses of a particular company they won't know how long they will have to wait for one and will therefore tend to use the first service to arrive. This results in inefficient market processes, with a tendency of firms to compete on frequency, rather than price, and leads to smaller vehicles, informal operations, and the breakdown of scheduled service.

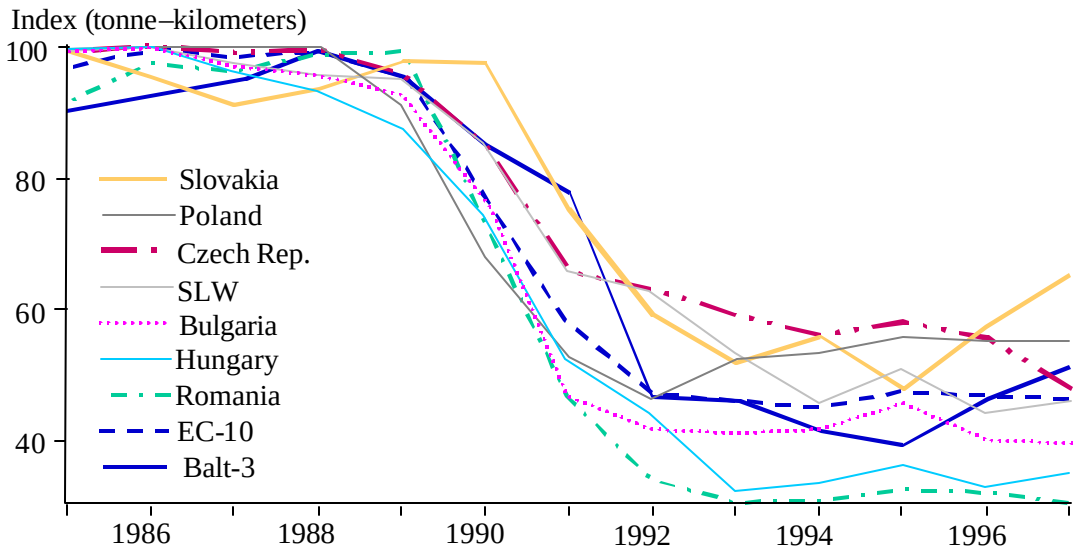
Strategic Considerations

A final complication is that transport is often considered of particular strategic importance, both for military operations and for national development. National governments thus typically wish to determine infrastructure provision. Where the vehicle is internationally mobile, such as a ship or aircraft, governments may also believe that national ownership of at least part of the fleet is of strategic importance, though they are usually wrong, of course. Right or wrong, though, a move to private provision must take account of these considerations.

Railroads: Restructuring Regulation for the Public Interest

Since the early 1950s an alarming decline has occurred in the performance of the railroad industry in both industrial and developing countries. In centrally planned economies, heavy industry and policies that accorded railroads most-favored status postponed the decline. However, after the abandonment of central planning the rail industry experienced an even steeper decline in those countries (Figure 3.1) (Thompson 2002).

Figure 3.1. Reduction of Railroad Cargo in the Transformation Period, 1985–1997



Source: Source: von Hirschhausen and Meinhart (2001).

Several factors contributed to this decline in performance: increased competition from more technologically advanced modes of transport; monolithic industry and rigid management structures unresponsive to customer needs and demands and to marketplace opportunities for innovation; excessive political interference; overstaffing; and regulatory regimes poorly suited to promoting the public interest. In most countries, the technological imperatives and locational patterns of a 19th-century economy had determined the design and construction of the rail network. With the emergence of alternative technologies and modes of transportation and shifts in the locations of industry and the consuming population, much of the rail network in many countries became almost obsolete. Advances in jet technologies and cost-saving innovations in automobiles significantly eroded the railroad's competitive position in passenger markets. In freight, the railroad's historical dominance was undermined by a shift away from bulk commodities toward high-value products,

increasing the importance of service quality and on-time delivery—not common characteristics of traditional rail systems.

Over the years, the railroad industry has had difficulty adjusting to these changes in its market environment. Misguided regulatory policies exacerbated the industry's problems, reducing its incentives and ability to respond. For example, cross-subsidies from freight to passengers accelerated the loss of rail's freight market share to trucking. The combination of public ownership and exclusive monopoly dulled incentives to control costs.

Most rail operations in the DTEs have had extraordinary levels of excess employment: the ratio of labor costs to revenues has typically exceeded 50 percent, and in many cases it has been well above 100 percent (the only notable exception being China, with a ratio of less than 20 percent). Political pressures on prices and governmental control over investment decisions, suspension or termination of services, and construction of railway facilities contributed to the deterioration in performance. Governments often imposed investment programs that did not reflect the railroads' true developmental priorities (World Bank 1994). More attention tended to be given to the achievement of physical targets (such as tonne– and passenger–kilometers) than to sound economic and financial planning. The industry's chronic revenue shortfall impaired its ability to attract capital for maintenance, replacement, and modernization. Government intervention through ownership and regulation has, therefore, been responsible in large part for mediocre service, the poor financial condition of the railroads, deterioration of physical plants, suppression or delay of cost-saving innovations, and misallocation of freight traffic between competing transport modes.

The first serious signs of financial distress appeared in the United States, where public policy on the privately owned railroads largely ignored the emerging intermodal competition and the government continued to tightly regulate the industry. The bankruptcy, or virtual bankruptcy, of several major railroads in the1970s threatened service in important areas of the country. A series of financial crises also affected British Railways from the late 1950s to the early 1990s. The rail systems of continental Europe experienced substantial erosion of market share in both freight and passenger traffic. Their dire financial condition was in major part due to high labor costs: the ratio of labor costs to revenue ranged from 80 and to more than 200 percent. A serious financial crisis also confronted the Japanese rail system, which experienced operating losses in excess of $15 billion per annum, leading to a staggering cumulative debt of more than $337 billion (Kopicki and Thompson 1995). The railways in Latin America, Sub-Saharan Africa, and other DTEs had reached a similar

state of physical and financial collapse by the early 1990s. The flow of traffic in many countries was impeded by undermaintained track, and locomotives were often unavailable. In Brazil, for example, in the early 1990s more than 40 percent of the track was in bad condition, and 35 percent of locomotives were immobilized in the workshops at any one time, typically awaiting parts or funds for repair (World Bank 1994). The drag of railroad subsidies and financial losses on government budgets also exacerbated the fiscal crises confronting many DTEs. In Poland, the railroad suffered a major financial loss in 1998, amounting to $300 million on a turnover of $1.8 billion, owing to the losses on passenger traffic. The Ugandan Railways Corporation was consistently ranked among the top three public-enterprise recipients of subsidies from the Government of Uganda (PPIAF 2001). In the early 1990s, the Brazilian railroad required continual support from the public treasury, amounting on average to more than $250 million a year (Estache et al. 2000).

These problems led to a profound reassessment of public policy towards railroads in both advanced industrial and developing countries. Although the reforms vary across countries, they include several important common elements: (a) altering the vertical and horizontal structure of the industry; (b) rebalancing the roles of the private and public sectors in supply; and (c) restructuring the relationship between the railway and the state and modifying the character of railroad regulation.

In the United States, the objective of policy reform was to free the industry from many arcane regulatory constraints that proved ruinous to its performance and to replace regulation with competitive market forces. In 1980, the U.S. Congress passed the *Staggers Act*, which substantially deregulated the railroad industry. The Act granted the Interstate Commerce Commission expanded authority to give the railroads pricing flexibility and to allow abandonment of unproductive and redundant track and other facilities. A program to extensively restructure Japanese National Railways was launched in 1986, creating nine new enterprises (six vertically integrated passenger railways, a freight operator, an infrastructure holding company for part of the track, and a settlement corporation). This privatization lasted through to the late 1990s. In the early 1990s, the United Kingdom restructured British Railways, vertically and horizontally. The government subsequently privatized 6 freight businesses and the entire infrastructure and competitively awarded 25 franchises in the passenger segment. At the beginning of the 1990s, virtually all the rail systems in Latin America and Africa were owned by the state. A decade later, most of those in Latin America and several in Africa were concessioned to private operators (Thompson 2002).

Current Issues of Public Policy

The same economic characteristics that make the rail industry a natural target for government intervention also render it particularly difficult to regulate in the public interest. The old regulatory systems failed to solve the central regulatory problem in railroads and certain other network utilities (for example, telecommunications and electric power): the mixture of competition and monopoly elements in supply (Baumol and Willig 1987).

Box 3.1. Economies of Scale, Scope, and Density in the Railroad Industry

There are substantial economies of scale in the provision of some rail services—whether focused on particular routes or types of freight and other movements—which result from the heavy fixed costs associated with rail operations. To transport even small amounts of freight or passengers, a railroad must generally incur the costs of track, right of way, locomotive power, crew, and certain facilities. These costs do not rise proportionately with traffic volume.

Another pertinent feature of the railroad industry is that there are substantial economies of scope, which result from the common costs of rail operations. Outlays on rails, ties, right of way, yard facilities, locomotion, and train crews are among many common costs incurred in carrying passengers and various types of freight between a variety of origins and destinations. These shared costs confer economies of scope on carriers offering a multiplicity of transportation services: a carrier that provides an array of services can do so at a lower cost than a set of carriers producing each service separately.

Comparing the average costs of railroads that have different sized route networks does not provide information directly relevant to economies of scale, because such railroads are likely to offer quite different collections of services as a result of their different route mileages and architectures. The correct and relevant measure in railroading is the degree of scale economies relating to traffic volume on each particular route—economies of density—rather than to the extent of the traffic on an overall and possibly growing system.

The Regulatory Problem

Pervasive economies of scale and scope (Box 3.1), high costs of entry, and small numbers competition in the railroad industry are all consistent with the likely persistence of prices in excess of marginal cost. However, while scale economies go hand in hand with natural monopoly, a railroad may or may not have the price-setting discretion of a textbook monopolist. It all depends on whether the activities characterized by economies of scale and scope are shielded from other sources of competition and have protective barriers to entry.

In the railroad industry, extensive capital sums must be sunk in way, structures, and ancillary facilities, to create new rail lines. These large sunk costs may suggest that the railroad industry is not structurally competitive or contestable. However, railroad services are far more contestable than

these impediments to rail entry would suggest, because there are often strong competitive pressures from other modes of transportation.

The basic patterns of railroad regulation, established many decades ago under wholly different market conditions, are simply obsolete. Their premise was that railroads had a collective monopoly, or near monopoly, on long-distance land transport. This condition disappeared long ago, if indeed it ever existed. Nearly every sphere of rail service now faces intense competition. Rival products and rival sources of supply—including trucks, barges, buses, airplanes, pipelines, and even alternative rail routes—are likely to impose effective competitive constraints on many rail activities. In Brazil, for example, the railroad's pricing power in petroleum transportation declined in recent years because of the new pipelines (Estache et al. 2001). In those activities where the railroad shows no evidence of market dominance, it should be offered freedom in pricing. Still, in other instances the competitive checks of intra- and intermodal, geographic, and product competition might be weak or nonexistent (such cases might include the long-distance movement of commodities and minerals in countries such as Brazil, China, India, and the Russian Federation). In these cases market forces may fail to prevent excessive pricing. The resulting monopoly power is the basic justification for regulation of rail rates and earnings and defines the basic task with which regulation must grapple.

In practice, effective competition can assume a variety of subtle forms. In freight, for example, coal shipped by rail competes with oil and natural gas shipped by pipeline. Thus, competition from petroleum products can limit the price railroads can charge for carrying coal. Therefore, policymakers should never proceed in haste to undermine the workings of the market through special intervention.

Structure and Ownership of the Railroad Industry

The historical model of railway operations in the DTEs is a single, state-owned monolithic organization controlling all facilities, operating and administrative functions and determining what services to provide to a significantly captive market. But the conditions that generated this model no longer exist in most countries, and governments have had to consider fundamental restructuring of the railway entity itself and the relationship between the railway and the state. The objectives for such restructuring have properly included injection of more innovative and efficient management, reduction of railway deficits and the burdens of public subsidies, increased competition with other transport modes, and more responsiveness to the needs of emergent private enterprises.

Options for Vertical Structuring. Three generic options can be identified for the vertical structuring of railways, addressing the set of relationships between the railway and other transportation entities (both rail and other), the markets served, and the functions performed (Figure 3.2). These functions include ownership; improvement and maintenance of the fixed facilities; control of operations, such as dispatching and freight classification; train movement; equipment provision and maintenance; marketing; and financial control and accountability. Determining which of these options is the best choice is a complex policy decision.

- *Option 1: The monolithic railway*—The status quo is frequently the traditional monolithic, integrated entity, owning and operating all its own facilities and vehicles. In theory, this approach should maximize production efficiency by exploiting the economies of scale and scope of rail operations. In practice, the monolithic entity, lacking financial incentives and desegregated information on profitability, is, at best, production oriented, unresponsive to market demands for services, and hierarchical (if not bloated) in organizational architecture. Some Latin American and African countries are developing spatially separated but completely vertically integrated private companies. In most countries using this model, competition comes primarily from road (or sometimes waterway) haulage. For example, most of the nonurban concessions in Latin America and Africa (including those of Côte d'Ivoire–Burkina Faso, Cameroon, and Gabon and those in preparation in Senegal–Mali) are vertically integrated, predominantly freight carriers competing with the deregulated road freight sector. In the U.S. case, competition occurs as well between the rail companies for major traffic flows.
- *Option 2: Competitive access*—Competing railway companies have exclusive control over some trackage but also exchange rights of competitive access with other companies. Some forms of competitive access include joint terminal agreements or conferrals of trackage rights, whereby one railway obtains the right to use the freight-handling facilities or line-haul tracks of another railway at a particular location or along a particular route. Another arrangement may be to hand off interlining traffic between distinct railroad entities in preference to the use of trackage rights. In the United States, railroads do a great deal of largely unregulated interlining, perform reciprocal switching under regulated terms, and exercise trackage rights as a result sometimes of free negotiation and sometimes of regulatory mandates (mostly achieved in settlements of disputes over rail mergers).

- *Option 3: Vertical separation*—The ownership of track and other fixed facilities is separated from other rail functions, with the track assets held by government, a consortium of operators, or a regulated private entity. A recent example is the joint terminal company in Mexico that was created to give the three major freight concessionaires nondiscriminatory access to Mexico City and to ensure access to the track by future suburban passenger operators.

Figure 3.2 Market Structure and Ownership Options in Railroads

Private involvement →

Structural change ↓

	Public ownership	Partnerships: concessions or franchises awarded	Private ownership
Monolithic	China, Russia, and India (ministries), MAV, SRT, MZ, others (SOEs)	Argentina (13), Brazil (9), Mexico (5), Peru (3), Guatemala, Bolivia (2), Panama, Côte d'Ivoire/ Burkina Faso, Cameroon, Congo (Brazzaville), Malawi, Madagascar, Jordan	New Zealand, Ferronor (Chile), CVRD (Brazil), A&B (Chile)
Competitive access	Amtrak, VI, Japan Freight, CN	Mexico City suburban, CONCOR (India)	U.S. Class I, CN, and CP East-West-Central, Japan Railways
Vertical separation	E.U. and Chile Passenger, Banverket	Swedish suburban, FEPASA (Chile), LHS line (Poland)	U.K. franchises and EWS, Polish and Romanian freight

Comparing Vertical Separation with Competitive Access. The primary virtue of separating the ownership of track and trains is that it may permit active or potential competition to reign among rail operators. Under this option, operators need not be subject to regulation, as they would have all the powerful incentives of competition to be efficient and responsive to the needs of shippers and a growing entrepreneurial economy. However, separation may create serious coordination problems, loss of economies of scope, and otherwise unnecessary transaction costs. The investment incentives of the track owner might not be compatible with those of the rail operators. Clearly, the investment incentives of the infrastructure monopolist will depend critically on whether it is a state-owned entity, or, if it is in the private sector, on the character of its regulation. Serious contractual and investment coordination issues arose, for example, in the vertically unbundled British railway system: Railtrack and the operating companies frequently could not agree on the timing of needed track repairs. This led to a significant increase in broken rails, with obvious safety consequences

(Yvrande 2000). This problem could be especially serious in many DTEs, where significant new investments are required to rehabilitate the track and other fixed rail installations.

Separation of operations from infrastructure in a railroad system is no panacea for regulatory problems (Box 3.2). As a policy direction, it must be compared with the leading alternative: competitive access. This option differs most clearly from the vertical separation option in allowing integrated operations by the rail entity. Competitive access may include a requirement that the integrated carrier make its facilities available to other entities on a fair and equal basis. However, if the integrated carrier has strong incentives to keep other entities out, it is unclear how effective such equal-access mandates are likely to be. The rail industry, like other regulated industries (for example, gas pipelines, telecommunications, and electric power), has seen many disputes, with claims of unfair and unreasonable exclusion from a carrier's facilities despite rules of equal access (Rosellon and Halpern 2001).

Box 3.2. Disadvantages of Vertical Separation

The provision of many innovative and market-responsive rail services may require specific investment in infrastructure, such as maintaining or upgrading way and structure facilities, constructing loading and transshipment facilities, and building spur tracks to reach a shipper's location. It may be difficult and inefficient for any operator to coordinate, as necessary, with the infrastructure-monopoly entity, especially if their investment incentives are out of harmony.

Efficient, safe, and delay-minimizing use of track and yard facilities requires close coordination of the priorities of both operators and shippers. Competing operators will compete vigorously and acrimoniously over scarce or congested infrastructure facilities, and constantly sorting out their claims will be important for the overall efficiency and responsiveness of the rail system. This would be difficult enough for an unintegrated system with a monopoly-infrastructure entity, but it seems virtually impossible while having to deal with rules against discrimination and tightly regulated or (for a state enterprise) politicized infrastructure pricing.

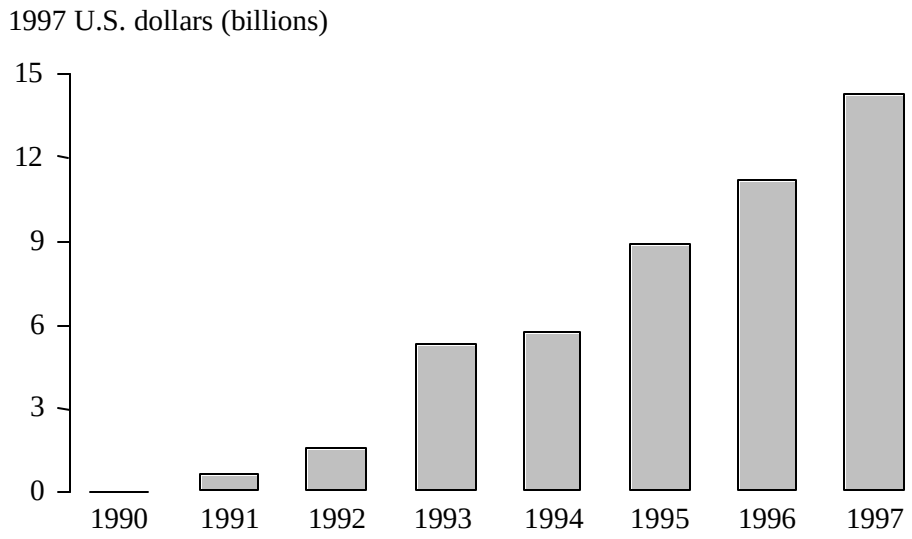
For competition to be powerful, the entering operators must believe they can avoid heavy sunk investments in rolling stock and specialized facilities. Locomotives and freight cars may indeed be an example of capital on wheels, so long as they can be transported to alternative points of gainful use without substantial costs. While this is likely to be the case for services provided in the middle of a landmass with a rich rail network ready to accommodate the cars, it may not be the case for more specialized cars or for a more isolated market. Also, the entering operator may not have yard, loading, car maintenance, or spur facilities available unless new and significant sunk investments are made. For these to be equally available to the entering operator and the incumbent operator, the infrastructure entity will have to have made the needed investment as part of its role ir the system. But the more the infrastructure entity has to supply the entrepreneurship and risk-taking investment, the less is gained by the separation, as the infrastructure entity is either a state-owned or a tightly regulated private sector monopoly.

Efficient pricing to cover replacement costs is made more difficult by separation. Where economies of scale are important, efficient pricing to cover replacement costs requires that shipments of different commodities on various origin–destination routes bear prices with different relationships to marginal costs. If the operator firms can readily evade price discrimination by the infrastructure entity so that the entity cannot collect these different prices for use of the facility to ship various commodities, it will be difficult if not impossible to defray the costs of the infrastructure efficiently.

Source: Kessides and Willig (1995).

Clearly, if the regulations permit the integrated carrier to charge higher prices to captive shippers when it does more business, it would have incentives to exclude other participants (this effect arises under rate-of-return regulation). Likewise, if the regulations constrain the amount an integrated carrier can earn from the portion of access services it provides when it does cooperate with another entity, it has incentives to undermine or avoid efficient cooperation, to enlarge its own portion of service (Ordover et al 1985). The carrier might also be motivated to exclude an efficient participant to weaken, in a predatory manner, that participant's competitive impact in another market. An integrated carrier would have an incentive to undermine efficient cooperation under classic rate-of-return regulation or under a system of regulated divisions that specifies what an

Figure 3.3. Cumulative Investment in Rail Projects with Private Participation in Developing Countries, 1990–1997



Source: Tynan (1999).

integrated carrier can earn from a cooperative movement. Both were features of U.S. rail regulation at one time and should be avoided in the DTEs.

Ownership Options. In response to the declining financial and physical condition of the railways during the past decade, many fiscally constrained DTEs sought to restructure their rail systems and increase private sector participation in their operations. Thus, the 1990s marked the reemergence of private railways, after more than half a century of public ownership and management. By the end of 1997, fourteen DTEs had taken some steps to move railway activities from governmental to private control. In these countries, private companies entered into 37 new contracts for the operation and management of railways and committed to investing more than $14 billion for rehabilitation or construction of infrastructure (Figure 3.3).

Only a few countries have fully privatized their railways. As Figure 3.2 indicates, there has been a multiplicity of approaches, combining various degrees of private–public ownership and competitive restructuring. Figure 3.2 also makes it clear that the monolithic, fully vertically integrated, state-owned railway option is becoming obsolete and is no longer a preferred or feasible option. The dominant form of private participation in the DTEs is the concession (franchise) to manage and operate existing railways, with obligations for major capital expenditures to refurbish assets. In some cases this is a complex arrangement. For example, in the Sitarail concession in Côte

d'Ivoire–Burkina Faso, the ownership of the infrastructure and operating assets remains formally with two national patrimony companies. The concessionaire must make a payment into their investment and renewal funds and must service the debt on any investment they make from their own resources on behalf of the concession. In Mexico, in contrast, the state-owned railway was split into a number of route-based companies, each of which was awarded a 50-year concession. The government immediately put to auction 80 percent of the shares of the concessionaire companies and eventually sold 100 percent.

Table 3.1 Private Rail Projects and Investment by Region, 1990–1997

Region	Number of projects	Investment (1997 US$ millions)
East Asia and Pacific	7	7,959
Europe and Central Asia	1	0
Latin America and the Caribbean	26	6,458
Sub-Saharan Africa	3	0
Total	37	14,417

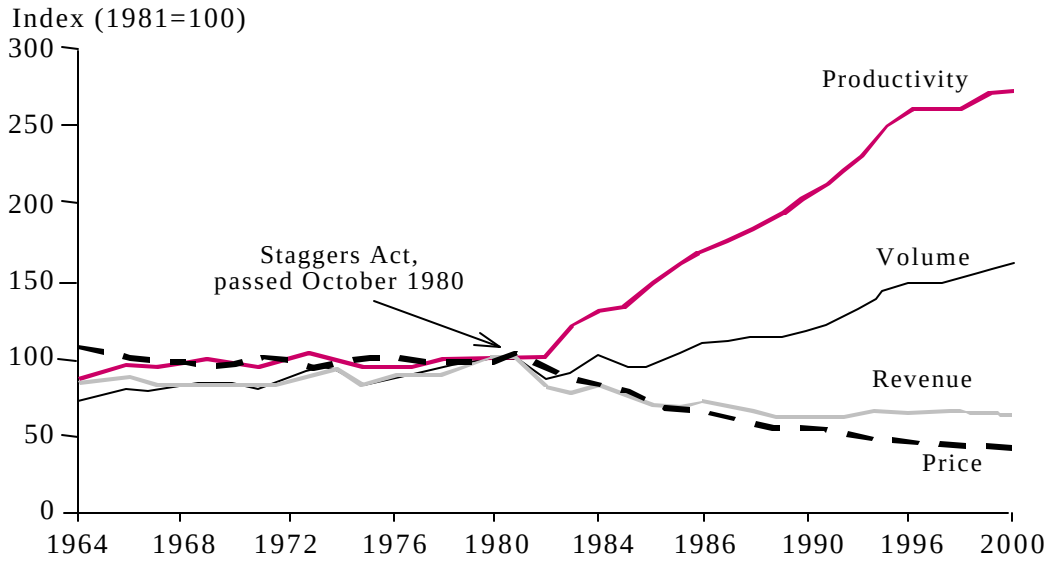
Source: **Tynan (1999)**

Latin America has clearly led the way in railway privatization (Table 3.1). Seven countries in the region awarded a total of 26 contracts to private entities during 1990–1997. Latin America's dominance in private railway projects can be attributed to the region's generally positive experience with private sector participation in other infrastructure sectors. Countries in East Asia and Pacific awarded fewer privatization contracts, but their total investment exceeded that in Latin America, owing to the different nature of these projects (greenfield projects involving heavy metropolitan systems and build–operate–transfer contracts). Only a few privatization projects reached financial closure in Sub-Saharan Africa and Europe and Central Asia. Countries in the Middle East and North Africa have yet to transfer any railway operations to the private sector.

The Effects of Restructuring, Deregulation, and Privatization

The new regulatory regime in the United States has produced a dramatic renaissance in the physical condition and market responsiveness and orientation of the railroads (Figure 3.4). Since the *Staggers Act* came into force, rail productivity gains have exceeded those of nearly every other U.S. industry (Braeutigam 1993; Wilson 1997). From 1981 through 2000, labor and locomotive productivity increased by 317 and 121 percent, respectively. Lower rail rates—on average, down 59 percent in real terms from 1981 to 2000—have saved shippers and their customers more than $10 billion annually. After decades of steady decline, rail market share (measured in ton–miles) has

Figure 3.4. Class I Railroad Performance, 1964–2000

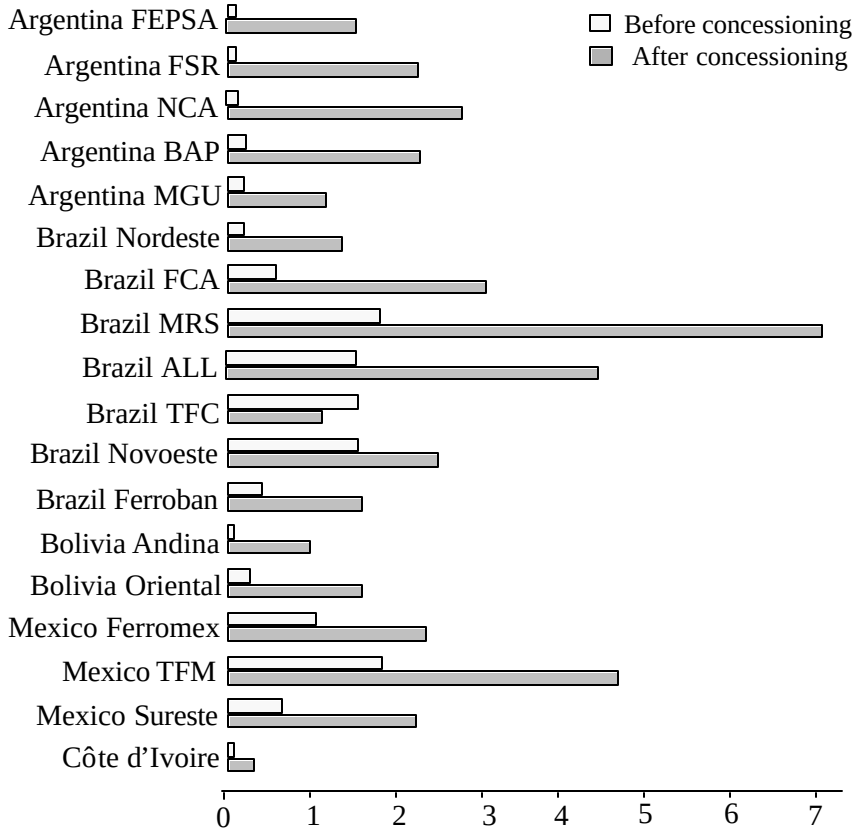


Source: AAR

tended slowly upward, from 35.2 percent in 1978 to more than 40 percent today.

The magnitude of the effects of restructuring, deregulation, and private participation in the DTEs has also been significant. Several policy dimensions previously closed to state enterprises contributed to these gains. First, as part of their privatization agreements, the new operators could resolve the issue of excess employment, one of the most vexing problems that had plagued the state owned railroads. Second, the freedom to change price structures (up to a specified maximum rate) allowed the concessionaires to attract traffic for which they had a comparative advantage. Third, in some cases freedom to withdraw from unremunerative activities (including passenger services) enabled them to concentrate on more productive ones. Fourth, low expenditure on equipment investment and maintenance had been damaging to performance (for example, in mid-1995 the Brazilian railways were only able to put out half their locomotives and were even refusing traffic on this account), so the physical refurbishment that in some cases preceded the concessioning helped restore the railways' capability to serve their chosen markets.

Figure 3.5. Rail Labor Productivity Before and After Concessioning



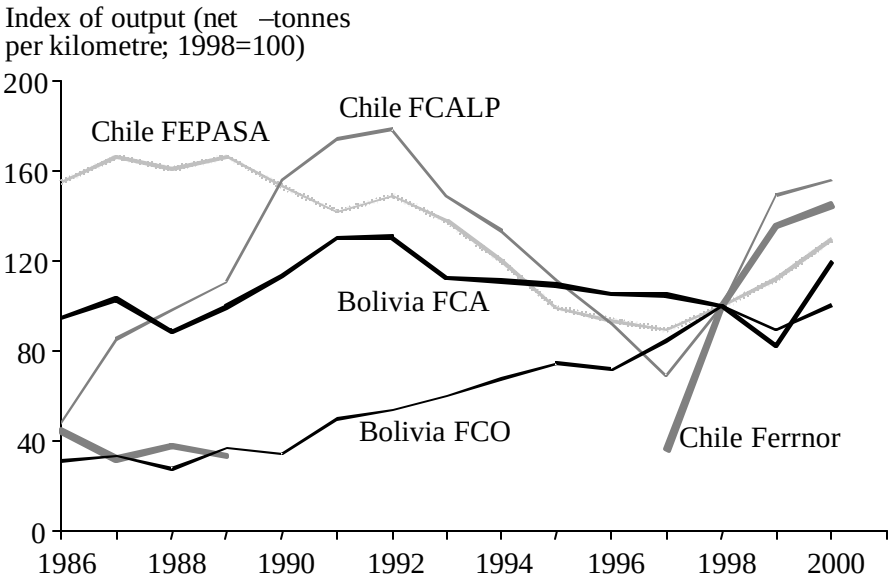
Source: Thompson and Budin (2001).

The privatization significantly reduced the labor force in almost all cases, varying from a 7.6 percent reduction in Côte d'Ivoire–Burkina Faso to a 92.1 percent reduction in Argentina. These reductions have not usually been due to withdrawals of service but were accomplished primarily through programs dealing with labor redundancy. The Argentine railways reduced staff from 94,500 in 1989 to 12,900 today. In Estonia, Mexico, and Poland, the labor reductions were 44, 66, and 20 percent, respectively.

The rationalization of the labor force, especially when combined with traffic growth, led to dramatic increases in labor productivity. In all but one case (Côte d'Ivoire–Burkina Faso) the railway's output (expressed as the sum of tonne–kilometers plus passenger–kilometers) per employee has at least doubled. In fact, it has more often tripled or even quadrupled (Thompson and Budin 2001). As Figure 3.5 indicates, the productivity improvements in relative terms have been rather similar for the Argentine and Brazilian freight railways. The explanation for the lower proportionate change in Bolivia is that its low wages for labor reduced the incentive to decrease employment. The Côte d'Ivoire–Burkina Faso concession experienced fairly low labor productivity gains for the same reason. In absolute terms, the differences can be explained largely by the nature of the markets served. In Brazil, the Rede Ferroviaria Federal S.A. (RFFSA)–MRS Logistica S.A. line of business mostly carries large volumes of iron ore downhill to the sea. Such traffic can be highly productive, as the experience of Latin America and elsewhere clearly demonstrates.

Caused in large part by poor service, lack of technological progress, and ineffective management, the decline in the railroads' traffic base (for example, in Argentina, between 1965 and 1990 the railroad's share of freight traffic declined by 50 percent) was stemmed and reversed after concessioning. Better service, combined with greater pricing flexibility and declining freight rates, led in most concessions to a significant increase in the volume of freight carried (Figure 3.6).

Figure 3.6. Volume of Freight in Latin America, 1986–2001



Source: Thompson et al (2001).

The post-reform pricing behavior in several DTEs has given significant benefits to rail users. Table 3.2 presents estimates of the tariffs charged at the beginning of each concession and those charged in 1999 (all calculated in 1999 purchasing power parity dollars). In Latin America, freight rates declined between 7.7 and 53.6 percent. Similarly, in Côte d'Ivoire, freight rates fell by almost 14 percent between 1995 (the year the concession was granted) and 1999. Of the 16 cases of privatized railroads presented in the table, 14 had lower tariffs in 1999 than at the beginning of the concession. These tariff reductions led to annual savings of about $1 billion in transport costs for the six countries in the table; moreover, these estimates understate the true magnitude of total savings, because they do not account for the competitive pressures that lower rail tariffs exerted on trucking and other competing transport modes

.

Table 3.2. Tariff Experience and Savings, Initial Year and 1999

	Tariff					
	Initial year	Initial year (PPS$/ tonne–km)	1999 (PPS$/ tonne–km)	Output 1999 (tonne–km)	Total savings[a] (millions PPP$)	Tariff reduction (percent)
Côte d'Ivoire	1995	0.123	0.106	523	8.9	13.8
Argentina broad gauge	1993	0.039	0.036	6,898	20.7	7.7
Argentina standard gauge	1994	0.032	0.043	495	(5.4)	-34.4
Bolivia FCA	1996	0.061	0.098	557	(20.6)	-60.7
Bolivia FCO	1996	0.147	0.123	626	15.0	16.3
Brazil						
ALL	1996	0.044	0.033	10,285	113.1	25.0
Bandeirantes	1998	0.038	0.023	5,984	89.8	39.5
FCA	1996	0.051	0.032	7,268	138.1	37.3
MRS	1996	0.027	0.022	26,837	134.2	18.5
Nordeste	1996	0.056	0.026	709	21.3	53.6
Novoeste	1996	0.043	0.027	1,588	25.4	37.2
Tereza Cristina	1996	0.120	0.101	259	4.9	15.8
Chile Fepasa	1994	0.089	0.053	1,189	42.8	40.4
Chile Ferronor	1996	0.072	0.046	743	19.3	36.1
Mexico Ferromex	1997	0.041	0.036	20,638	103.2	12.2
Mexico TFM	1997	0.054	0.043	17,256	189.8	20.4
Total					990.4	

Note: PPP, purchasing power parity

a. Calculation of savings from lower rates

Source: Thompson et al (2001).

During most of its history, the Brazilian railroad system generated negative returns on its operations. In the early 1990s, the Brazilian railroads obtained higher unit revenues than most of the freight railroads in the continent (in 1994 their tariffs ranged between $0.47 and $0.67 per tonne–kilometer, compared with $0.27 per tonne–kilometer charged by Conrail in the United States). Still, the railroads were experiencing substantial financial losses. In 1995, Rede Ferroviaria Federal (RFFSA) lost $308 million, and its accumulated debts reached $4 billion (Estache et al. 2001). These persistent financial losses reflected pervasive organizational inefficiencies and low productivity; failure to rationalize operations by shedding low-density lines, excess capacity, and redundant labor; and government-imposed obligations that fettered the railroad in the face of intensifying intermodal competition.

As part of the restructuring process, which started in 1995, Brazil divided RFFSA into six freight concessions, reduced total labor from about 110,000 in 1975 to 42,000 in 1995 (leading to significant increases in labor productivity), completely removed subsidies for public service obligations, and accorded the new operators considerable pricing flexibility. Operators were permitted by regulation to engage in demand-differentiated pricing and negotiate shipper contracts

Table 3.3. Financial Performance of Rede Ferrovaria Federal S.A. Before and After Privatization, Selected Years, 1993-1999 (US$ million)

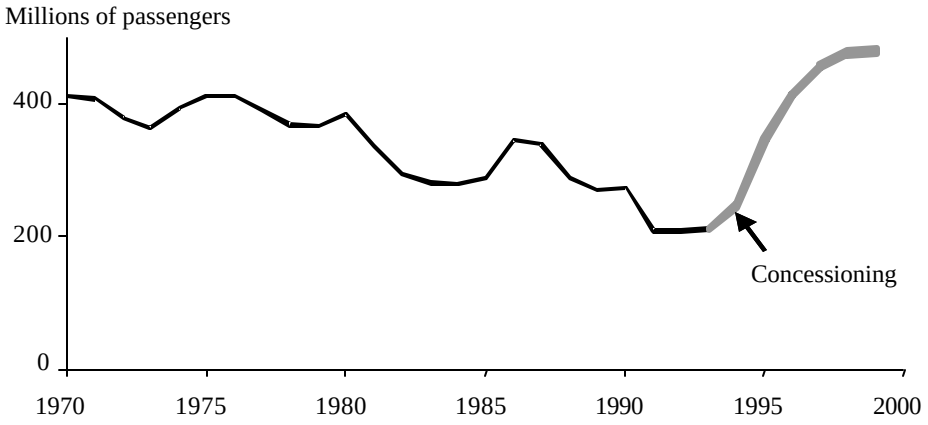
	1993	1994	1996	1997	1998	1999
+ Gross operating revenues	757.8	799.4	572.6	34.1	77.9	21.9
+ Other income	28.1	35.8	473.4	273.8	1714.2	768.8
= Total gross revenues	785.9	835.2	1046.0	307.8	1792.1	790.7
- Taxes	34.5	40.9	66.0	15.3	12.6	18.8
= Net operating revenues	751.4	794.3	980.0	292.6	1779.5	771.9
+ PSO Subsidies	14.5	21.3	0.0	0.0	0.0	0.00
= Total net revenues	765.9	815.6	980.0	292.6	1179.5	771.9
- Total operating expenses	850.4	974.7	533.3	63.8	821.2	520.1
= Net operating profits	-84.5	-159.1	446.7	228.9	958.3	251.8

Note: PSO, public service obligation.
Source: Estache, Goldstein and Pittman, 2001a.

with confidential terms and conditions. RFFSA's losses fell progressively, and its net operating profits turned positive in 1996 (Table 3.3).

Patronage of the suburban passenger rail sector has also grown after concessioning. In Argentina, where Buenos Aires unbundled its metropolitan rail and metro services into seven concessions, this increase was quite substantial (Figure 3.7), suggesting significant consumer benefits. The main

Figure 3.7. Suburban Rail Traffic in Buenos Aires, 1970–2000



reason for this appears to have been increased service reliability and passenger safety, although increased attention to fare collection may have resulted in some overstatement of the real level of patronage increase. What is clear is that fare reduction was not initially part of the explanation.

The Need for Residual Post-privatization Regulation

Economic regulation in railroads should be confined to two basic functions: protecting captive customers (those who have no competitive alternatives) and ensuring that competing railroads have nondiscriminatory access to the track and other bottleneck rail facilities.

Two basic principles should guide the reform of railroad regulation. First, the competitive market should serve as the model for regulation. Market forces will generally constrain pricing in most rail activities in the majority of countries. An important source of this constraining influence is obviously intermodal competition, especially from trucking and barges in freight; and buses and airplanes in the passenger segment. Regulatory restraints should be imposed or continued only where market forces are insufficient to enforce competitive behavior. Second, regulatory impediments to earning adequate revenues should be eliminated. This should mean, not a guarantee of profitability, but an opportunity to obtain competitive earnings. Indeed, in a regime of deregulation without general subsidies, a key element in protecting the public interest is eliminating any residual regulation that interferes with the financial viability of the rail network. Regulatory reform should, therefore, give railroads substantial flexibility in the areas of pricing and industry structure.

The regulatory issues identified below—regulatory protection for captive shippers, cost allocation, and access to rail infrastructure—are cross-sectoral, that is, they also arise in electricity, telecommunications, ports, and to a lesser extent water. Chapter 6 offers a more detailed treatment of these issues and suggests approaches and solutions consistent with the unique characteristics of many DTEs and their infrastructure sectors.

Regulatory Protection for Captive Shippers

In some countries (for example, countries in Africa and large countries such as Argentina, Brazil, China, India, Poland, and the Russian Federation), the railroad might have a strong competitive advantage in moving commodities and minerals over long distances, especially when the road system is in poor condition. For example, about two-thirds of the traffic of RKP, the Polish state

railway, consists of hard coal, metal, ores, brown coal, and coke (Ordover and Pittman 1994). In the Russian Federation, the railroad carries more than 90 percent of shipments of coal, ore, ferrous metals, and cement; 80 percent of chemical and mineral fertilizers; and 70 percent of construction material. Competition from road transport is growing for containers, perishables, and high-value goods, but this competition is largely limited to west of the Urals and the Far East, where the highway sector is well developed. Most of the Russian Federation's industrial customers continue to depend on the railways, which effectively enjoy a monopoly. Without rail-to-rail competition, the strength of intermodal competition may fail to restrain monopoly pricing under these circumstances. In Brazil, several mining companies are captive users of Ferrovia Sul Atlântico, Ferrovia Centro-Atlântica, and Ferrovia Novoeste, as they lack meaningful competitive alternatives. Many captive shippers of Companhia Vale do Rio Doce protested in 2000 that the railroad unfairly pressured them to carry out specific investments before being allowed to use its services (Campos 2002).

Long-term contracts for rail service offer shippers protection from the exploitation of future captivity by a single railroad, particularly if these contracts can be negotiated when the shippers are making their investment and locational decisions. Regulatory policy should properly focus on shippers caught in the transition to a privatized and less-regulated rail system. Some of these shippers may have made investment and locational decisions before the reform. The costs of such decisions are often sunk, making it more difficult for the shippers to make competitive adjustments when facing higher rail rates. This type of situation reveals the conflict between rate protection for shippers and increased rate flexibility for railroads and highlights more than any other the need for regulatory intervention to achieve the proper balance.

Cost Allocation

The substantial fixed and common costs in the railroad industry create a number of problems for government regulation. Perhaps the most troubling is the fact that it is impossible to allocate these costs in a mechanical fashion that is unique and has any foundation in economic logic. Accounting and arbitrary cost allocation rules can have pernicious effects on the efficiency of utilization of transport resources, cause misallocation of traffic among competing modes, and seriously conflict with the financial viability of railroads, as the U.S. experience clearly indicates.

Access to Rail Infrastructure

Rail infrastructure remains a natural monopoly, regardless of the option adopted for the industry's structure. Any operator seeking to run services between two points in most countries has the choice of only a single provider of infrastructure. Thus, it is generally accepted that regulations are needed to govern the terms and conditions of access to bottleneck rail facilities (Nash and Toner 1998). The access problem is especially vexing when several railroads compete in the sale of final services while one of these firms is the monopoly owner of the track and other essential infrastructural facilities (competitive access option). In a variety of market settings, the holder of bottleneck rail facilities has incentives to behave anticompetitively and create artificial handicaps for its rivals. Vertical separation mitigates, but does not entirely eliminate, the need for access policy, as the U.K. experience clearly indicates.

Lessons Learned

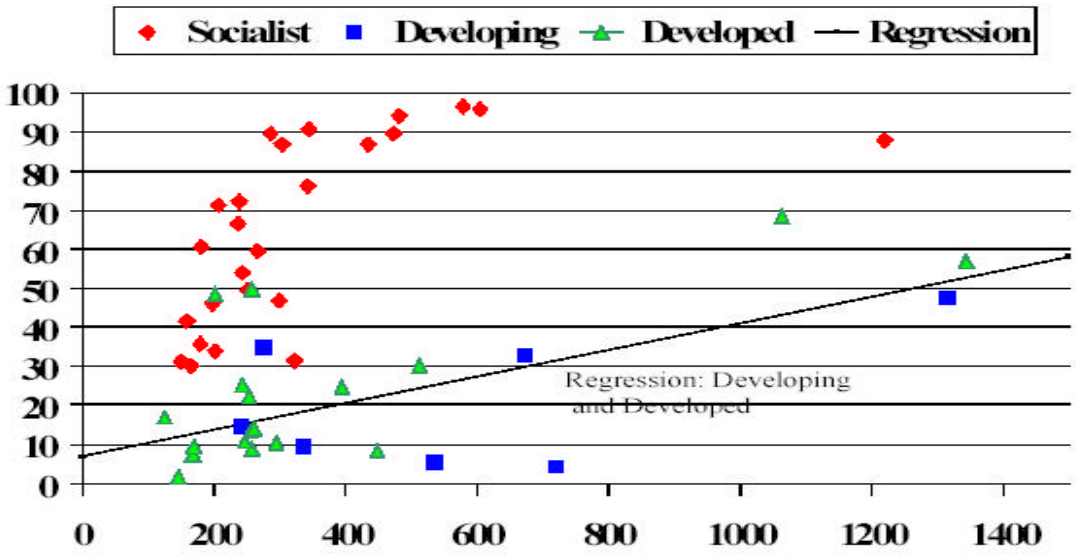
During the past decade, the railroad industry experienced some of the most sweeping structural changes ever observed in the transport sector. However, in most DTEs, the process of railroad restructuring and privatization is at too early a stage to permit a clear assessment of long-term impacts. Still, the experience to date offers some general insights into the reform process:

- The restructuring of railroads raises several difficult policy questions with no clear-cut or universal answers: Is the organizational separation of track ownership and train operations conducive to economic efficiency? How much pricing freedom should the infrastructure entity have to efficiently recover its replacement costs? What regulatory restrictions should be imposed on the pricing of a dominant service provider facing weak intra- and intermodal competitive pressures?
- Injecting competition into the railroad industry is not an easy task. It requires the introduction of new and rather complex regulatory mechanisms. Although many DTEs might lack the expertise needed to implement these regulatory schemes, maintaining the status quo (that is, a monolithic, state-owned railroad) is arguably the most costly option.
- A wide variety of approaches can be taken to bring more competition into the domain of railroading and its vertical relations. However, few reforms have significantly enhanced intramodal competition. Most of the benefits of structural reorganization seem to derive from

unsettling the embedded business culture and providing management with the needed flexibility, independence, and incentives to become efficient and fiscally responsible and to respond to the growing intermodal competition. Thus, public policy in the DTEs may appropriately focus on freeing the rail entities from all unnecessary regulatory restraints and creating a level playing field between rail and other transport modes, rather than attempting to create rail competition through aggressive structural remedies. This is especially important in Central and Eastern Europe and the Commonwealth of Independent States, where rails shares of freight traffic are still unusually high (Figure 3.8). While physical impediments (such as underdeveloped and poorly maintained highways) to the use of alternative transport modes and a continued emphasis on extractive and heavy industries are the most likely explanation, policies favoring the rail industry have also played a major role.

- Ownership and market structure options form a continuum in the rail industry. To choose one of these options is a complex policy decision: many important country- and industry-specific characteristics need to be considered. Countries differ significantly in size, level of development, institutional capacity, density of the rail network, condition of the fixed rail facilities, strength of intermodal competition, and efficacy of public finances. In view of these differences, the uncritical choice of extreme options (totally private or totally public; full vertical integration or complete vertical separation) could be an indication of ideology, rather than a carefully designed policy for the public interest.

Figure 3.8. Rail Share of Total (Rail + Truck) Traffic versus Average Length of Haul, 1998



Source: Thompson (2001).

Ports: Alternatives for Organizing a Multiproduct Activity

Historically, ports have played a vital role as the gateways for economic trade and commerce of most nations. Shipping remains by far the main mode of international transport of goods, and more than 80 percent of trade with origins or destinations in developing countries, in tonnage, is waterborne (al Khouri 1999). As an important determinant of maritime transport costs, seaport efficiency is critical to the success of any strategy to integrate a country into the world trading system (Clark, Dollar, and Micco 2001). Excessive port costs reduce the competitiveness of a nation's products in world markets and can impede economic growth and development.

In recent years, technological innovation and changes in the content of international trade have led to a far more integrated model of operations in international transport. Ports have become nodes in a seamless global logistics supply chain. The globalization of economic activity and strong competition in the capital-intensive liner shipping industry have increased the demand for optimal capacity utilization and effective delivery of integrated logistics services. Moreover, total port container throughput is forecast to reach 270 million TEUs (20-foot equivalent units) by 2005, a 55 percent increase over the figure for 1998. Even accounting for productivity improvements, there is considerable need for investment in new port facilities: roughly 200–300 additional full-fledged container terminals. Port operators and authorities are, therefore, under more pressure to adapt their roles and functions and to improve their efficiency and labor productivity, in particular (Juhel 1998). This will require a fundamental internal reorganization of ports, a rebalancing of the roles of the private and public sectors, and regulatory reform aimed at eliminating the arcane administrative constraints that stifle productivity and investment in ports.

In response to these pressures, many countries have taken important steps to reorganize the operation and management of their ports. These reform efforts have increased private sector activity in ports dramatically, especially in developing countries, where the public sector could no longer finance the substantial investments needed for system expansion and modernization of existing installations. However, there was also a widespread belief that, regardless of financing constraints, private sector management would lead to improvements in port strategy and operations, decrease

excessive government control, and more effectively deal with restrictive labor practices. The magnitude of the efficiency gains from increased private sector activity will depend, to a large extent, on the efficacy of the port regulatory system. Failure to provide an adequate economic regulatory framework could result in inefficient and high-cost port services.

Key Economic Characteristics of Ports

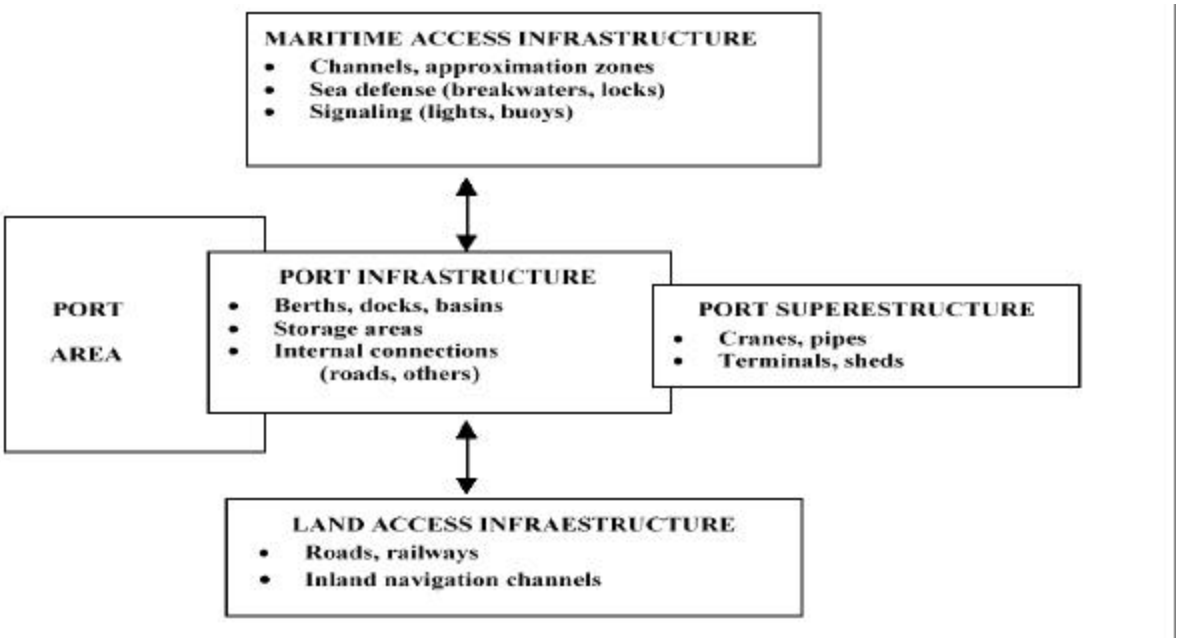
From a technical perspective, the port sector may be characterized as having a large, indivisible initial basic capacity requirement that is immobile (sunk) and has a long life. From an economic perspective, port operations are characterized by large fixed costs, especially in the case of container terminals, where up to 80 percent of total costs are fixed; strong economies of density (unit costs fall as more ships and cargo are handled through the existing port facilities [Walters 1979]); and increasing returns to scale (costs per unit of traffic handled decline as the size of the port increases [Button 1993]). Ports have therefore traditionally been viewed as exhibiting natural monopoly characteristics, justifying direct public sector involvement both in provision (for capital availability reasons) and in operation (for monopoly control reasons).

The Multiproduct Character of Ports

The above simple characterization breaks down on elaboration, however, as ports are multiproduct organizations, encompassing diverse activities with entirely different economic characteristics.

Port Infrastructures. A port typically needs several types of capital assets (Figure 3.9). It needs

Figure 3.9. Port Infrastructures



Source: Trujillo and Nombela (2000).

infrastructure for maritime access (channels, protective works, sea locks, lights, and buoys) and for land access (roads, railways). Activities within the port need the basic port infrastructure (berths, quays, docks, storage areas) and the so-called superstructure (fixed assets, such as sheds, office building, and fuel tanks; and fixed and mobile equipment, such as cranes and van carries).

The maritime and land access infrastructures entail long-lived assets, largely sunk, whose costs cannot be easily assigned to specific users. These assets therefore are not an attractive proposition for private investors and are typically held by the government. Conceivably, they could also be held by a consortium of port operators. Many of the assets of the basic port infrastructure and superstructure are long-lived assets, too. However, their costs can be assigned to specific users without too much difficulty. There is, therefore, much greater scope for private participation and investment in those infrastructures.

Port Services. In addition to infrastructure and superstructure, ports provide a multiplicity of services (Table 3.4). For example, the movement of freight traffic through a seaport generally involves the following sequence of technically distinct activities: On arrival (or before) a vessel is allocated a berth and typically requires tug assistance and piloting to navigate safely through the appropriate channels into and within the port. On berthing, the vessel requires cargo handling, onboard (stevedoring) and on land. The cargo also normally requires stacking or storing (not least for customs purposes) before being released for land transport out of the port area. Other value-adding activities often take place in the port. The vessels themselves require a range of services while in port, including bunkering, tank cleaning, and repairs and maintenance. The appropriate form of private participation, and hence of regulation, may differ by function.

Table 3.4. Port Services

Services to the vessels	• Pilotage • Towage • Mooring • Dredging • Utilities • Ship repair • Environmental services
Services to the cargo	• Stevedoring • Wharf-handling • Transfer to land transport • Storage • Processing (consolidation, bagging, mixing) • Cargo tracking and EDI • Security • Rental of specialized equipment

The Scope for Unbundling. As with other network utilities, natural monopoly conditions are likely to characterize most port infrastructure, which is long-lived and costly. Unlike the other

utilities, as noted above, a port provides a wide variety of services, rather than a few specific products (see Table 3.4). The operation of most of these services may be conducive to competition. Although there are economies of scale and inevitably some sunk costs associated with the provision of these services, they are smaller than those associated with the infrastructure. For example, the bulk of the capital costs involved in towage and related services amounts to the purchase of tugs. There is an active international market for tugs, including second-hand tugs, and modifying second-hand tugs for use in a different port is cheaper than buying new ones. The capital costs of acquiring tugs cannot be considered a material barrier to entry, as only a small portion of such costs is sunk. Towage is therefore a contestable activity.

Considerable opportunities exist for introducing competition and lessening the need for regulatory oversight in ports through unbundling—that is, by separating those activities that are naturally competitive or seem to entail no inherent structural impediments to contestability (arguably most of the services and parts of the superstructure) from those that exhibit global or extensive scale economies or perhaps only those inextricably associated with heavy sunk costs (such as access and basic infrastructure). In the naturally competitive segments, all interference with the market mechanism and any truncation of property rights should be ruled out, and the scope for introducing competition should be fully exploited. The public sector should regulate or even run those segments with an unavoidable natural monopoly or substantial amounts of sunk capital.

Seaports have also gotten more involved in providing, within their curtilages (surrounding premises), logistics services (storing, order-picking, packing, and distributing) that add value to a product. The possibility that the private sector can profitably develop such activities has become an important consideration.

Box 3.3. Organizational Structures of Ports

Service port, publicly owned
- Public sector owns land, infrastructure, and equipment
- Public sector provides services

Tool port
- Public sector owns land, infrastructure, and equipment
- Public sector leases its equipment and space to private service providers on a short-term basis

Landlord port
- Public sector owns the land and the infrastructure
- Private sector provides services on a long-term basis through concessions or build–operate–transfer contracts

Service port, privately owned
- Private sector owns all land, infrastructure, and equipment and provides services
-

Source: **NERA (2001).**

Models of Port Organization

A multiplicity of activities occur simultaneously at any given port as ships constantly enter; unload and load, get serviced, and exit. Thus, all ports have a need for a coordinating agent to ensure the proper use of common facilities, oversee safety, and perform systemwide planning. In most ports, a public institution called the port authority performs these functions.

The four main port models (in order of decreasing public sector involvement) are public service ports, tool ports, landlord ports, and private service ports. What services they provide depends on the role of the port authority and the degree of private sector participation (Box 3.3).

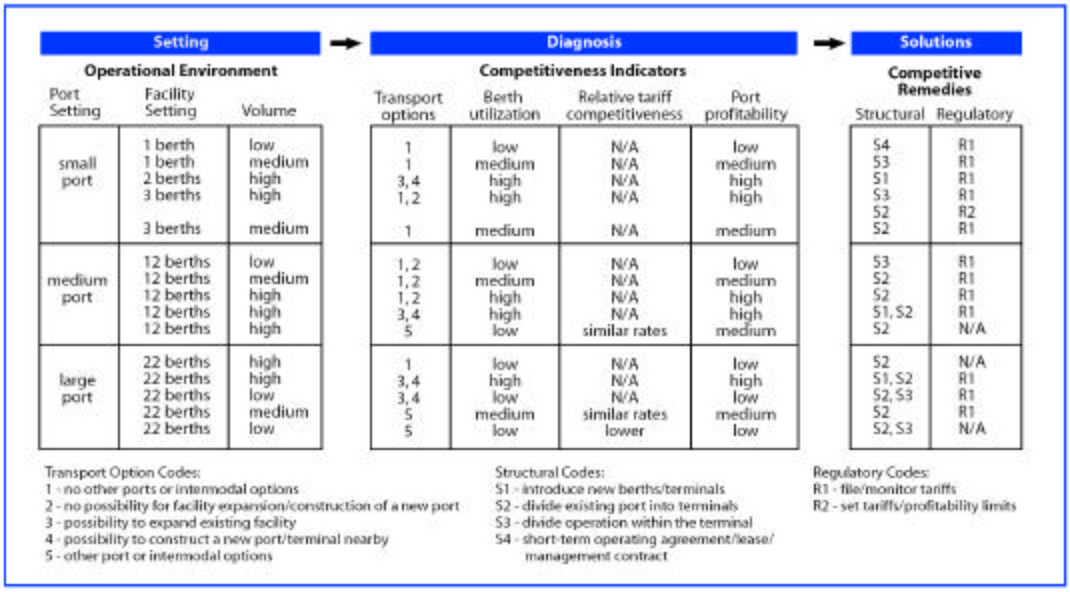
The trend in the DTEs has been to move from the public service and tool models to the landlord model. However, many ports in developing countries (for example, India and Sri Lanka) still adopt the publice landlord model is already common in the largest ports: more than 90 percent of the top 100 container ports can be classified as landlord ports (NERA 2001).

Strategies for Introducing Competition in Ports

Experience suggests that most of the benefits of private sector participation in port activities stem from competitive pressures. Strong competitive forces also considerably reduce the scope of needed regulatory oversight. Thus, the critical question is, What can governments do to enhance competition in line with the unique characteristics of ports and marketplace opportunities for innovation? They can foster or stimulate competition in a number of ways:

- *Interport competition* can be fierce, as it is, for example, between the major container hub ports of East Asia. The major shipping enterprises are intensely demanding and expert at playing off one port against another. The effectiveness of a particular port in these contests may depend critically on its ability to process traffic quickly and reliably and integrate its activities with inland or feeder networks. Such external competition may be the most important determinant of the degree of internal regulation that a port requires.
- *Intraport competition between terminals* is an option allowing technically efficient integration of the in-port functions, without sacrificing competitive pressure within the port for more local captive traffic. Terminal operators have total jurisdiction over their own terminal area, from berth to gate. This is the device adopted to great effect in the liberalization of the port of Buenos Aires.
- *Intraterminal competition between service suppliers* is encouraged by many ports. Competition in stevedoring, warehousing, forwarding, etc., is highly desirable wherever it can be physically accommodated. From a port authority's viewpoint, this may be influenced by licensing requirements, which limit the number of competitors but make the concessions attractive for competitive tendering.
- *Competition for the exclusive right to provide services* is an extension of the competitive tendering of licenses and may be the only way to attract private participation in the finance of new developments in small ports. Where local monopoly rights are granted, the usual question arises: To prevent subsequent monopoly exploitation, should contracts be used or should a discretionary regulatory authority be established?

Figure 3.10. Decision Framework for Port Competition



Source: World Bank Port Reform Toolkit (2000).

Governments and port authorities can take a number of actions to enhance competition. These structural remedies include introducing new berths or terminals; dividing an existing port into competing terminals (terminalization); dividing port operations within terminals; and introducing short-term operating lease or management contracts. The choice of form of competition and the choice of residual regulatory requirements are interrelated and depend to a large extent on the size of the port, the extent of external competition, and the degree of captive traffic that needs protection. Figure 3.10 presents a diagnostic device for assessing strategies to enhance port competition.

The Effects of Restructuring, Deregulation, and Privatization

The results of private participation in ports have been impressive. In the DTEs, private investment has accelerated: more than $12 billion was invested in 127 projects during the 1990s. Latin America and East Asia have led the trend in private involvement in port operations, with five countries accounting for two-thirds of the investment. Economies with recent port privatizations include Brazil, China, Colombia, Estonia, Latvia, Lithuania, Malaysia, Mexico, Mozambique, Panama, Poland, the Russian Federation, and Tanzania.

One of the key hypotheses underlying the privatization movement is that, compared with private owners and operators, public owners and operators are less able (and have fewer incentives) to

control costs; are slower to adopt new technologies and modern management practices; and are less responsive to the needs of users. One of the earlier tests of this hypothesis came with the 1986 divestiture of the container operations of Kelang Port Authority (Port Kelang is Malaysia's largest port). Privatization led to significant efficiency gains. The improvement in the rate of crane handling from 19.4 containers an hour in 1985 to 27.3 containers an hour in 1987 brought Kelang's performance close to Singapore's 28.0 containers an hour (Tull and Reveley 2001). Total return on fixed assets (at current market prices) grew at an annual average compound rate of only 1.9 percent from 1981 to 1986, but at a rate of 11.6 percent from 1986 to 1990. The higher return on fixed assets was due to improvements in productivity and greater throughput, not to higher prices. Workers also benefited from the gains in productivity. By 1990, they were paid 60 percent more an hour in real terms, put in 6 percent more hours, and produced 76 percent more than before privatization (Galal and others 1994).

Similar improvements in the physical performance of ports were brought about by privatization and deregulation in several other countries. Colombia concessioned its four main public ports in 1993 to separate regional port societies, established under company law. These societies do not provide services directly but contract with operators, who use the facilities. New laws also abolish restrictive labor practices and allow stevedoring services to compete freely at each port. Although the initial concessioning involved little investment, the main element in its success seems to have been the development of effective competition, not only within each port, but also between ports. These reforms led to significant improvements in operating performance (Table 3.5).

Table 3.5. Colombia: Operating Performance Before 1993 and After Reform, 1996

Indicator	Before 1993	1996
Average vessel waiting time (days)	10	No wait or hours, depending on the port
Working days per year	280	365
Working hours per day	16	24
Tons per vessel per day		
Bulk cargo	500	2,500 minimum
General cargo	750	1,700
Containers per vessel per hour (gross)	16	25

Source: Puertos (Colombia General Port Superintendent, July 1997).

Port reforms in Argentina have demonstrated the powerful impact of deregulation and the effectiveness of inter- and intraport competition. Before the reform, port operations were costly and inefficient, because of restrictive labor practices, overregulation by a multiplicity of agencies with no clear demarcation of responsibilities, and inefficient structural organization. As a result, the ports were losing market share to the road sector and to the more efficient Chilean ports (Estache and Carbajo 1996).

In the early 1990s, the Argentine government introduced several substantive reforms to deregulate and decentralize port operations and increase private sector participation and competition. It deregulated pilotage and towing services, lifted all regulatory controls on contractual agreements with stevedoring companies, permitted Argentine ship owners to temporarily register their ships under foreign flags, allowed foreign ships to practice cabotage, and gave operators freedom to set tariffs. One of the most important reforms was authorizing private sector entities to build and operate ports for public use. Actual and potential entry by private entities would inevitably undermine the market power of existing ports. The government also reorganized the largest port, Buenos Aires, into three areas with separate functions and administrations. One of these areas was further split into six terminals, which were to be concessioned to the private sector and compete with each other. Thus, the primary objective of this structural reorganization was to facilitate inter- and intraport competition (Estache, Carbajo, and de Rus 1999).

The effects of deregulation and privatization on port investment and performance were dramatic (Table 3.6). Between 1991 and 1997, in the port of Buenos Aires, annual container traffic jumped from 300,000 to more than 1 million; the number of cranes increased from 3 to 13; labor

productivity almost quadrupled; and the average stay for full containers decreased from 2.5 to 1.3 days.

Table 3.6 Selected Performance Indicators for the Port of Buenos Aires, Selected Years, 1991 –1997

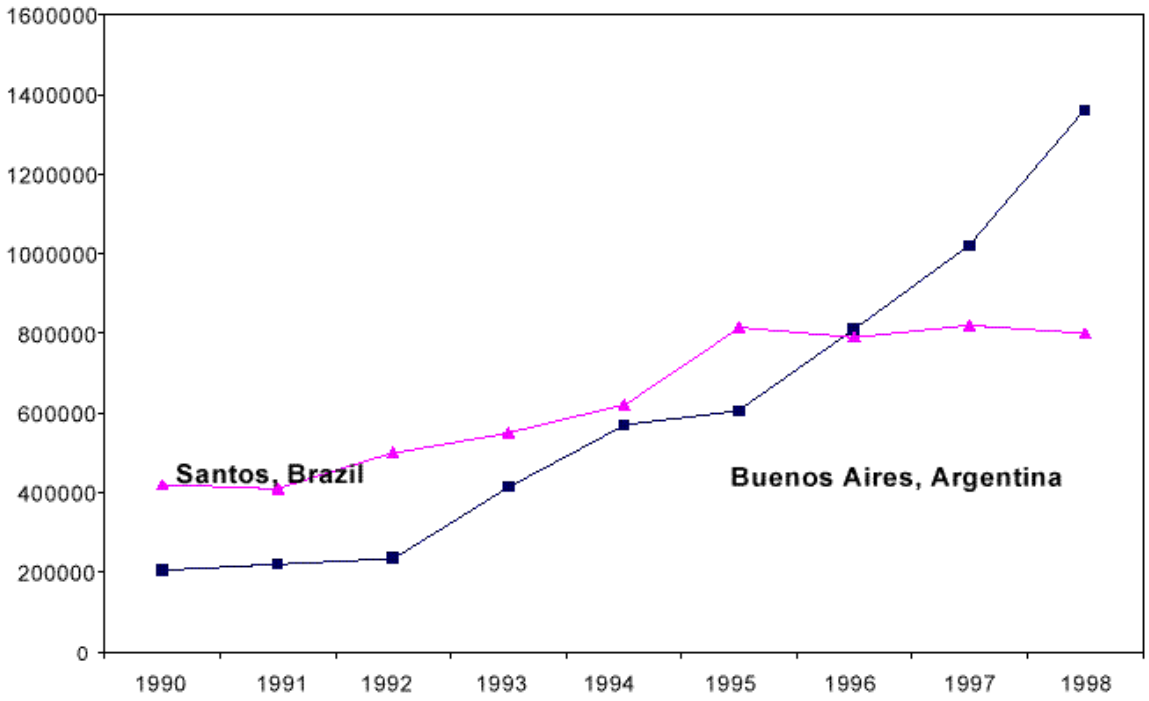
Indicator	1991	1995	1996	1997
Cargo (thousands of tons)	*4,000*	6,000	7,500	8,500
Containers (thousands of teu's)	*300*	540	752	1,023
Capacity (thousands of containers per year)	*400*	1,000	1,300	1,300
Cranes	*3*	13	13	13
Operational area (hectares)	*65*	95	132	132
Productivity (tons per worker per year)	*800*	3,000	3,050	3,100
Average stay for full containers (days)	*2.5*	1.5	1.5	1.3
Cost for container imports (US$ per ton)	*450*	120	120	120

Note: TEU, 20-foot equivalent unit.
a. Public operations in italics.
Source: Estache, Carbajo, and de Rus (1999).

It is important to note that some port services in Argentina were supplied by the private sector before the reform program was initiated in 1990. For example, the private sector managed stevedoring at the public port of Buenos Aires. However, no significant improvements in performance were obtained in the early years of private sector participation, primarily because of excessive regulatory control and lack of competition. This signifies the importance of substituting competition for regulation wherever feasible. This is relevant for many DTEs, where competition within or between ports has not been an important element of the overall reform program (Estache et al. 2001).

The substantial improvements in performance that were brought about by deregulation and private sector participation have allowed the port of Buenos Aires to successfully compete with the biggest port in South America, Santos, in Brazil (Figure 3.11). In fact, after 1977, the throughput of the Buenos Aires port surpassed that of Santos (Micco and Perez 2001).

Figure 3.11. Container Throughput in Buenos Aires and Santos, 1990–1998



Source: Micco and Perez (2001).

In Mexico, an aggressive program of decentralization in the mid-1990s led the way to the concessioning of the country's major ports to private operators. These reforms are too recent to have produced their full impact. Still, preliminary evidence indicates notable improvements in efficiency and productivity, and the deregulation of prices has led to significant tariff reductions: tariffs are now equal to, or lower than, those of U.S. competitor ports.

In 1993, the port of Veracruz was handling 43 containers an hour per ship. This figure now has risen to 84. Similar improvements occurred at the Manzanillo and Altamira ports. The total capacity in Veracruz for loading and unloading agricultural bulk cargo increased from 2,000 to 9,000 tons a day between 1995 and 1998. Similar capacity improvements were obtained in Progreso and other ports, indicating that privatization induced significant new investment in infrastructure.

The reform program accorded the port operators considerable pricing flexibility. Firms can now freely set prices, so long as there is sufficient competition in the market. In ports where competition is inadequate, regulatory intervention takes the form of maximum rate ceilings or price caps. To provide operators with the maximum incentive for efficiency, caps are to be revised every five

years. The improvements in ports' physical performance were passed on to users in reduced costs and tariffs (Table 3.7), which in turn led to a substantial increase in port traffic.

Table 3.7. Change in Cargo-Handling Tariffs in Mexican Ports, 1995 and 1998 (1998 pesos)[a]

Ports	Agricultural bulk goods		Mineral bulk goods		Palletized goods		Containers	
	)ec 998	an 995	)ec 998	an 995	)ec 998	an 995	)ec 1998	an 1995
Veracruz	4.0	6.3	6.7	7.1	4.5	6.9	,467.5	,554.9
Manzanillo	5.0	1.4	5.0	9.8	7.0	5.1	,554.0	,466.0
Lázaro Cárdenas	7.7	1.7	6.3	5.0	8.2	2.2	,247.4	,655.8
Altamira	I.D.	9.3	I.D.	7.5	8.0	1.7	,315.0	,655.8
Tampico	1.3	9.3	7.2	7.5	9.2	1.7	968.9	,143.6
Weighted average reduction	-34.5 %		-24.5 %		-21.7 %		-5.6 %	

Note: N.D., no data.
a. In 2003, 10.889 pesos=US$1.00
Source: Secretaria de Comunicaciones y Transporte

The fiscal impacts can also be significant. For example, in the five years before privatization, in 1995, the Mexican port system received an average of 665 million pesos per annum in government support. Following privatization the port system has been able to cover its costs and has actually begun to generate substantial tax revenues for the government (Table 3.8). This improvement in the system's financial condition has allowed the port authorities and the concessionaires to undertake substantial investment in system expansion and modernization.

Table 3.8. Financial Position of Mexican APIs, 1995–1998

	1995	1996	1997	1998
Revenues	510,832	951,048	1,263,572	1,718,832
Expenses	436,107	781,009	1,022,690	1,340,723
Profits	74,725	170,039	240,882	378,109
Taxes	24,833	64,399	96,993	137,560

Note: Financial figures in thousands of pesos.
API: Administración Protuaria Integral (Integral Port Administration).
Thousands of pesos.
Source: Secretaria de Comunicaciones y Transporte.

The Need for Residual Post-privatization Regulation

The primary objective of port policy is to assist national development. Although some emphasis has recently been put on port services that add value to the products, the development objective is usually best served by securing cheap and expeditious movement of traffic through the ports. To this end, the landlord port model introduces competitive pressures either *in* the market for provision of port services (between terminals or within terminals) or *for* the exclusive rights to provide services where the market is too small to support multiple providers. This may require structural controls to secure or maintain an appropriately competitive framework or, where structural measures are insufficient, then some control to prevent monopolistic exploitation or distortion.

Structural Approaches

The most complete form of privatization involves the transfer of ownership of whole ports or terminals to a single private operator. When there are many competing seaports, complete privatization may generate the most cutting competition. But where external competition is absent, severe problems arise. This is often the case in developing countries. In such circumstances the ability of the private owner to exploit its monopoly position may be a strong reason for stopping short of full privatization. It is likely to be easier to regulate a port concession, albeit for a monopoly location, than to protect the assets critical for national development once a country has formally transferred their ownership.

In recent years, global carriers have sought to entrench their competitive power with long-term contracts for dedicated terminals in strategically located ports. Such vertical integration of terminal operations with shipping activities can ensure competition in the largest ports. But in smaller ports, this can damage competition by enabling the integrated company, as the terminal operator, to use its monopoly power to favor its associated shipping activities, as in the case of APL's (American President Lines') operation at the Karachi International Container Terminal in Pakistan. In the recent round of concessions in Chile, no more than 40 percent of a concessionaire may be owned by any shipping company, exporter, or importer operating more than 25 percent of the transfers at the concessioned terminal or more than 15 percent of the transfers in ports in the region in the previous year (Foxley and Mardones 2000)

Horizontal integration can be equally threatening. A limited number of global stevedoring companies emerged during the 1990s, including Hutchison Port Holdings (Hong Kong),

International Container Services Inc., and PSA Corporation Ltd. (Singapore). The threat here is that a company controlling a large proportion of the terminals within a region could manipulate port usage to its own advantage, against national interests. For example, P&O Ports (Australia) has concessions for two of the five major container ports in India and may yet obtain two more: if successful they would control three-quarters of the container terminal capacity of the country. The European Commission actually refused permission for Hutchison International to buy a 49 percent share in ECT, Rotterdam on the grounds that as it already owned Felixstowe, Thamesport, and Harwich, it would have a dominant market position in northwestern Europe.

Regulation of Behavior

Seaports require many technical, environmental, social, and safety regulations. For example, technical oversight is needed to ensure safe movement, avoidance of environmental pollution through spillages, and so on; even social oversight is needed to ensure just treatment of workers and healthy working conditions. In most countries, these functions are regulated by sector agencies or by specialized agencies (health and safety, environmental pollution, etc.), usually attached to, or part of, the relevant line ministries. Agencies independent of port management should oversee technical regulation, whatever the degree of private participation.

Regulation of tariffs is only important when there is no adequate competitive influence, either internally or externally. Judging that can be a difficult issue. In Mexico, for example, the *Ports' Law* establishes that the Federal Competition Commission shall determine when to establish tariff regulation. Where the commission judges the competition as inadequate, it may stipulate either rate-of-return or price control to prevent monopolistic exploitation. In such cases rates may be set on the basis of benchmarks from comparable ports in more competitive situations or a synthesis of rates from cost data. Both are difficult methods, and the ultimate problem is that the regulated bodies are almost inevitably better informed than the regulator. Hence, tariff regulation should be avoided as far as possible. One way of avoiding this, adopted in the port regulatory structure for Sri Lanka, is to involve the regulator only in cases of disputed rates. Adjudicating disputes between port operators or between port users and operators may be the most important function of a regulator in a liberalized seaport sector.

CHAPTER FOUR

Restructuring Electricity Supply

Electricity is an essential input to almost all goods and services and is thus vital to the public interest. The reliability of the electricity system has steadily grown in importance as customers invest in sensitive electronics. In developing countries, especially, an adequate and reliable electricity supply is needed for modernization and for domestic growth and international competitiveness. Few challenges are more urgent in these countries than the promotion and safeguarding of citizens' and industries' access to reliable, competitively priced electricity.

Until recently, the electricity industry was typically a vertically integrated statutory monopoly, owned by the national, state, or municipal government. The past decade, however, has seen a dramatic change in views about how the industry should be owned, organized, and regulated (Newbery 2000). Since 1980, when Chile began a radical program of restructuring and privatization, more than 60 countries have introduced reforms in the electricity sector (Bacon and Besant-Jones, 2001). With a growing list of experiments in restructuring and privatization to guide the design of future policy, we are in a better position to reflect on the lessons learned and to identify the most important issues and available options. A clear-eyed assessment is especially important now because of the crisis in California's reform program and the challenges confronting the electricity systems of several developing and transition economies (DTEs). The recent events in California have alarmed policymakers around the world (Box 4.1) and could seriously impede the evolution of competitive electricity markets (Besant-Jones and Tenenbaum 2001; Joskow 2001). Some DTEs that had planned to introduce reforms might now defer them. Others will not consider further reforms until there is convincing evidence of the merits of competitive restructuring and deregulation.

Box 4.1 Disillusionment slows reform momentum in India

"The imperative necessity of restructuring/reforming the electricity sector in India to overcome the financial ill-health and technical shortcomings of the electricity boards is being repeated ad nauseum…Just when the process appeared to be virtually unquestionable and unstoppable, the 'consensus' has been shattered by the unbelievable news of the California electricity crisis."

Source: Frontline, Volume 18-Issue 13, Jun. 23-Jul. 06, 2001.

Background to Reform

After several decades of structural immobility in the electricity industry, governments are allowing market forces to play a role in generation and supply. During the past decade, in particular, structural change has accelerated and is now a worldwide phenomenon. Although only a handful of countries have achieved truly substantive market liberalization, almost all countries have felt considerable domestic and international pressure to reform their electricity systems.

Traditional Industrial Structures and Regulation

The electricity industry has three components: generation, high-tension transmission, and low-voltage distribution. (In recent years, as a result of sectoral reforms, the supply or retailing function—power procurement, billing, and customer service—has increasingly been considered a fourth component.) A wide variety of technologies and primary energy sources are used to generate electricity: nonrenewable sources include coal, petroleum, natural gas, and uranium; renewable sources include hydropower, wind, solar, geothermal energy, and biomass. The high-tension transmission grid is the "highway" for moving electricity from the generation sites to the distribution centers. From transmission substations, electricity is distributed to residences and businesses, at lower voltages, through wires and transformers.

Historically, the electricity industry has had a monolithic structure: a single entity owns the generating and transmission (G&T) capacity and performs all system controls and operations (Figure 1.1). The G&T entity transfers the power it produces to one or more distribution companies that hold exclusive rights to serve retail customers in specific geographic regions. In some countries, the distribution companies are independent entities with separate governance and legal structures, purchasing their power from the G&T entity under regulated tariffs. In other cases, there is a common ownership of the G&T and proximate monopoly distribution systems. In most countries except the United States, Germany, Japan, and Spain, these entities have been under public ownership (Joskow 1998).

Complementarities in transmission and generation give rise to significant economies of scale and scope, which in turn are the main reason why the industry evolved with a vertically integrated

Box 4.2 Characteristics of the electricity sector that create a rationale for structural integration

The economic rationale for vertical and horizontal integration in electricity derives from the unique characteristics of the transmission network and the important operating and investment interrelationships between generation and transmission. A key attribute of the transmission grid is its ability to aggregate the operation of geographically dispersed generating units into a stable synchronized network. Such aggregation allows real-time substitution of increased production from facilities with low marginal cost for that of facilities with higher marginal cost, thus improving system efficiency. It also increases system reliability by providing multiple linkages between loads and generating resources, and it can economize on the reserve capacity required for any given level of system reliability.[1] The aggregate generation of electricity and its consumption need to be balanced continuously and almost instantaneously for the network to meet specific physical parameters (frequency, voltage, stability). Unlike other switched networks, such as railroads or telecommunications, where the routing in the physical delivery of products can be specified, flows in electricity networks are very difficult to control. The transmission network is largely passive and has few "control valves" or "booster pumps" to regulate electric power flows on individual lines—electrons follow the path of least resistance and control actions are limited to adjusting generation output and to removing transmission lines from or adding them to service. Moreover, every action can affect all other activities in the grid—failure of a single element in the system (e.g. the shutdown of a generation unit or a transmission line), if not managed properly, can endanger the stability of the entire electricity grid. Similarly, large swings in load at one node affect the conditions at other nodes in the system. Thus, electricity requires careful and deliberate system-wide coordination to achieve supply/demand balancing in real time.

Source: **Joskow (2000).**

structure (Box 4.2). In most countries, the geographically dispersed generators are also horizontally integrated into a single firm. Transmission and distribution are the quintessential natural monopolies, although recent technological change is weakening this characterization to some extent, as discussed later. They entail substantial fixed costs that are largely sunk, and under these circumstances effective competition would inevitably lead to wasteful duplication of network resources. It is not surprising, then, that in most countries a single entity governs the transmission network covering all or most of the country. Although economies of scale in generation have never been as pervasive, vertical integration between the generation functions and the network elements of the natural monopoly effectively limits competition in the generating service, even when numerous generating plants are connected to the network.

A number of additional features that distinguish electricity from the other network utilities limit the scope for competition or reliance on free market mechanisms. Because of the hard physical constraints on electricity production, achieving real-time supply/demand balancing is difficult and requires intensive system coordination. Electricity supply is rigid by nature. Electricity cannot be stored economically, as the existing storage technologies—for example, hydroelectric pump storage (pumping water uphill) or batteries—are very inefficient. Thus, electricity is the ultimate real-time

product, with its production and consumption occurring at virtually the same time. Moreover, generating units have hard capacity constraints that cannot be breached without risk of costly damage. As a result, the amount of electricity that can be delivered at any time is substantially constrained, and especially at peak times supply is very inelastic (Borenstein 2001).

The challenges due to the unusual properties of the supply side of the market are exacerbated by the lack of flexibility on the demand side. Despite the availability of appropriate technologies, no electricity market today makes any significant use of real-time pricing—very few, if any, end-use consumers of electricity observe real-time prices. Demand is almost completely inelastic in the short-run. Thus, little or none of the critical supply/demand balancing can be done on the demand side. The combination of very inelastic short-run demand and supply (at peak times) with the real-time nature of the market (costly storage and grid balancing requirements) makes the electricity industry especially vulnerable to the exercise of market power (Borenstein and Bushnell, 2001).

Pressures for Electricity Reforms

The driving forces behind the structural changes in the electricity industry differ between countries, especially between industrial and developing countries. Pressure for change in mature industrial economies has grown with the emergence of excess capacity and disillusionment with expensive, capital-intensive generation projects precipitated by the oil crisis of the 1970s. The reform agendas of developing countries, in contrast, have been driven by the poor operating and financial performance of their state-owned electricity systems, lack of public funds to finance badly needed investments in the sector, and government desire to raise immediate revenue through privatization (IEA 1999; Bacon and Besant-Jones 2001).

Excess Capacity in Industrial Countries

In mature industrial countries, growth in demand, which had been remarkably high and steady for 30 years, was suddenly interrupted in the 1970s and never resumed its past trend. The understandable response to the oil shocks was to try to reduce dependency on oil for power generation. This renewed an interest in options such as nuclear power and large, supercritical coal-fired generating stations. Budgetary pressures, rapid inflation, and attempts by state-owned enterprises (SOEs) to keep the prices of their goods down as part of a counter-inflationary strategy

squeezed the profits of the sector, delayed the completion of investment, and led to a crisis of confidence in the previously smooth-running planning system.

Fate conspired to produce a benign conjunction of circumstances. The development of high-efficiency combined-cycle gas turbines (CCGTs) undermined the case for tightly integrated G&T systems based on economies of scale. The rapid development of gas pipelines and the increasing availability of cheap gas in western Europe and the United States made the new CCGTs more attractive than existing technologies. Dense, well-meshed electricity grids, the abundance of power stations, and excess capacity made competition between generating companies both feasible and attractive.

The reform and privatization of the electricity industry in the United Kingdom (UK) starting in 1990 demonstrated that it was possible to replace state-owned vertically integrated franchise monopolies with privately owned, unbundled and regulated successor companies without the lights going off. In short order, the European Union started pressing for liberalization in its member states and successfully passed the Electricity Directive forcing open access and liberalized markets starting in 1998. Similar pressures for open access and liberalized markets were under way in North America. In the United States, the reform process has been considerably complicated by ensuring that stranded assets would be compensated, though initially there was great confidence that a new deal could be struck that was beneficial to all parties. With unfortunate timing, just when the European Commission was pressing for further reforms, events in California shook political confidence in the liberalization agenda.

Need for Investment in Developing Countries

The circumstances in developing countries have differed in important respects. Whereas investment needs have been low in mature industrial countries with excess capacity, they have been high in countries undergoing a stage of economic development when demand for electricity is expected to increase rapidly. Worldwide electricity consumption has been projected to increase at an average annual rate of 2.7 percent from 1999 to 2020 (Table 4.1). The most rapid increase is projected for the developing world: 4.2 percent per year over the forecast horizon (EIA 2002).

In many developing countries, the electricity system has been under stress. The demand–supply balance is very tight, and the lack of spare capacity has led to frequent blackouts (Box 4.3). To redress this imbalance, significant new investments are needed in G&T and distribution. However,

the pre-reform governance structure in this sector—typically the vertically integrated, state-owned, and centrally planned model that the developing countries willingly adopted or retained in the era of independence after World War II—has proven ill-suited for mobilizing the long-term capital needed for securing an adequate and reliable supply of electricity

Table 4.1 World Net Electricity Consumption by Region, 1990–2020

(kilowatt hours, billions)

Region	History		Projections				Average annual percent change, 1999-2000
	1990	1999	2005	2010	2015	2020	
Industrialized economies	6,385	7,517	8,620	9,446	10,281	11,151	1.9
United States	2,817	3,236	3,793	4,170	4,556	4,916	2.0
EE-FSU	1,906	1,452	1,651	1,807	2,006	2,173	1.9
Developing economies	2,258	3,863	4,912	6,127	7,548	9,082	4.2
Asia:	1,258	2,319	3,092	3,900	4,819	5,858	4.5
China	551	1,084	1,523	2,031	2,631	3,349	5.5
India	257	424	537	649	784	923	3.8
Korea, Rep.	93	233	309	348	392	429	3.0
Other	357	578	724	872	1,012	1,157	3.4
Central and South America	449	684	788	988	1,249	1,517	3.9
Total world	**10,549**	**12,832**	**15,183**	**17,380**	**19,835**	**22,407**	**2.7**

Note: EE-FSU: Eastern Europe and the former Soviet Union.

Source: Data under History are from EIA (1999); under Projections, from EIA (2002b).

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In the early days of rapid growth and young plant, prices could be set at cost-recovery levels and even allowed to fall with the rapidly decreasing costs as economies of scale and new technology were exploited. Thus, initially the state-owned integrated electricity systems performed reasonably well. Over time, and especially as inflationary and budgetary pressures increased, the margin between revenue and costs was squeezed. The average price of electricity in most developing countries was not covering costs on a historical accounting basis and was often far below the long-run incremental cost of expanding the system. Such pricing made it

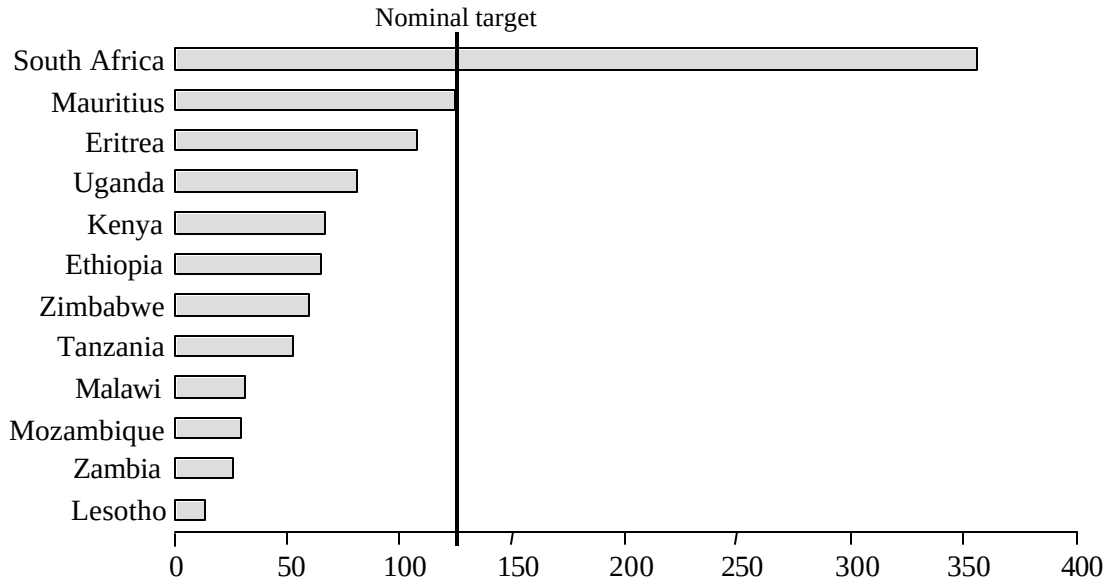
Box 4.3 Power shortages in Southeast Asia

In the Philippines, excess demand in 1992 corresponded to 48 percent of total system capacity. Brownouts often ranged from 4 to 10 hours a day. Shopping malls were ordered to reduce their hours of operation by 2 hours and industrial areas faced 12-hour blackouts three times a week. Of 512 international firms that had or planned to open their Asian headquarters in Manila, 123 closed their operations and 226 cancelled their registrations. In Thailand, reserve margins fell from approximately 40 percent in 1995 to just over 10 percent in 1989.

Source: Henisz and Zelner (2001)

difficult to finance new investment and to adequately maintain existing facilities. As a result, system adequacy and reliability declined, and supply shortages inevitably increased. Still, underpricing to favored groups became politically more noticeable and more difficult to reverse. Moreover, political interference led to extraordinary levels of excess employment (Figure 4.1) and management deterioration, and the lack of effective monitoring led to theft and losses that further undermined the

Figure 4.1 Customers per Employee in Selected African Countries, 1998



Source: Kerekezi and Kimani (2001).

financial sustainability of the sector. The sector was in far worse crisis than experienced by industrial countries, and for different reasons.

Technological Innovation

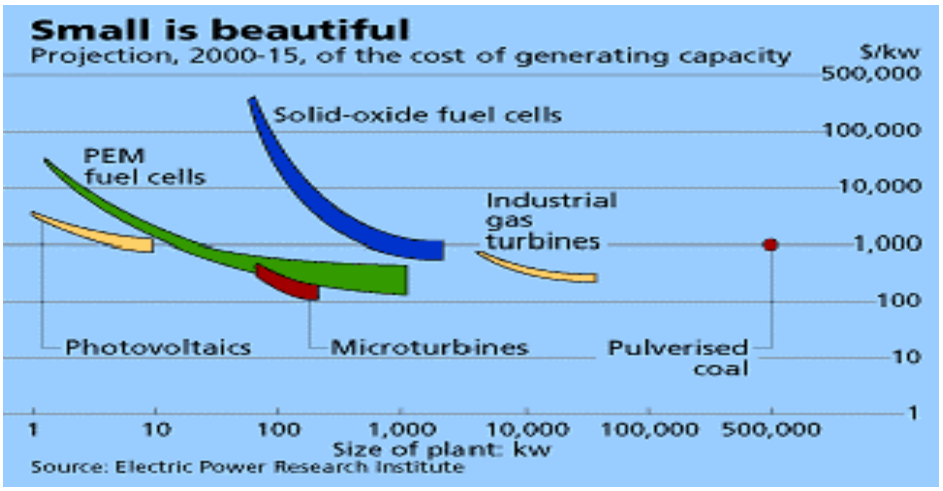
Recent technological advances have dramatically altered the cost structure of electricity generation. They are also changing the network economics of the electricity grid in both mature industrial and developing economies.

From the beginning of the 20th century until the early 1980s, technological developments led to larger and more efficient fossil-fueled power plants, built farther and farther from cities and factories. In recent years, however, technological improvements in gas turbines and the development of CCGTs have recast economies of scale in electric power and caused a complete reversal in the 50-year trend toward large, centralized power stations (Figure 1.2) (Bayless 1994; Casten 1995). CCGTs can be brought on-line more quickly (within 2 years) and at a more modest

scale (50–500 megawatts) than coal or nuclear plants (5–10 years and 1,000 megawatts). Aero-derivative gas turbines can be efficient at scales as small as 10 megawatts (Balzhiser 1996). Although natural gas and light oil distillates are the preferred fuels for gas turbines, a wide variety of low-calorific, contaminated fuels have also been used successfully (for example, the Kot Addu plant in Pakistan and the Paguthan plant in India have, respectively, accumulated 60,000 and 19,000 hours of successful operation burning heavy oil and naphtha.). Thus, gas-turbine technology is of growing importance, even for DTEs that lack natural gas resources (Taud et al 1999).

These small-scale generators are already being used by traditional utilities for peaking, as well as other purposes. They can also be used to bypass utility operations. As demand becomes sufficient for economies of mass gas-turbine production to be realized, the cost of producing electricity from small-scale generators is likely to decline, making it easy to add efficient capacity of 1–10 megawatts, the range needed for many factories, large housing developments, and other institutions (Figure 4.2). Small-scale combined heat and power production is also becoming economical, even at the level of individual households.

Figure 4.2 The Dawn of Micropower



Gas-turbine and other small-scale generating technologies will have an important effect on market structure. The ability to install small-scale, low-cost capacity will make it possible to move the industry away from the paradigm of the large-scale central station to a new distributed-generation model. With many small-scale generating units operating at or close to load, the historical reliance on transmission and even distribution facilities will clearly diminish. The development of new electricity-storage technologies could further reduce reliance on transmission

and distribution (Thomas and Schneider 1997). Although small-scale generators are not expected to displace large thermal plants, at least in the foreseeable future, any new generation capacity is likely to come from a range of smaller units.

The distributed-generation framework enhances the ability of the natural gas pipeline network to compete with the electricity transmission network. Small-scale generating plants delivering power at or near the point of consumption would place an upper ceiling on the price that the existing generators and transmitters could charge in combination. Gas-turbine capacity could have a disciplinary effect on transmission pricing without even being installed. The mere threat of bringing such capacity on-line would be sufficient to constrain the behavior of the transmission monopolist (Baumol, Panzar, and Willig 1988).

Small-scale electricity generation is altering the service landscape in several developing countries where there is no regulation or where entry to the sector is formally allowed. In the Republic of Yemen, small-scale operations supply rural towns and villages that are not served by the public utility. These operations range from individual households, generating power for themselves and a few neighbors, to larger generating units supplying up to 200 households (Ehrhardt and

Box 4.4 Opening the market – photovoltaic systems in Kenya

Where a formal utility fails to provide network services to many households, simply allowing entry may be sufficient to encourage entrepreneurs to fill the gap. In Kenya, the formal utility fails to provide an electricity connection in more than 98 percent of the rural population. Rural households have started to fill the gap by turning to alternative systems. Between 1982 and 1999 the market for photovoltaic units grew into a US$6 million a year industry.

In the 1980s, demand for photovoltaic systems came from NGOs installing demonstration systems in schools and missions, and from off-grid community leaders and medium-income households. Each year, the household market accounted for well over 50 percent of photovoltaic equipment sales.

Photovoltaic retailers realized that ongoing sales required an expansion of the market. The availability of smaller, lower-cost modules helped on the supply side. Local innovation in extending the marketing from lighting to television raised demand. In 998, local entrepreneurs were selling over 22,000 modules each year. Competition had brought the retail price down from US$100 a module in 1990 to US$65 in 1998. The introduction of hire-purchase options has extended the market further. Since 1990, 60 percent of the 2.5 megawatts of photovoltaic capacity sold has been in the household market.

Source: Hankins, 2000

Burdon 1999). In Kenya, because the rural population is so sparse, expanding coverage from the national grid would be very costly, so some rural households are being served by private companies offering a different technology: photovoltaic systems. (Box 4.4) Since 1990 more than 2.5 megawatts of photovoltaic capacity has been sold, providing power to more than 1 percent of the rural population of roughly 25 million people (Hankins 2000). Stand-alone photovoltaic systems are

also being used in Brazil, India, Namibia, Senegal, South Africa, and Thailand to power water pumps, streetlights, solar lanterns, and telecommunications relay stations. In Hargeisa, Somalia, following the destruction of the public electricity facilities during the civil war, private owners of generators with surplus power have been supplying 10,000 households at a flat daily uniform rate of approximately $0.35 (in current U.S. dollars). Some generators have formed an association and are seeking outside assistance to set up a more formal infrastructure for power supply (Marchal and others 2000).

Recent technological trends are also changing the economic characteristics of the transmission grid and raising the specter of future inter- and intra-network competition (Kunneke 1999). Advances in semiconductor technology offer the possibility of adding intelligence to the traditionally passive transmission network. The routing of electricity would be more actively managed if switches were attached to the grid to control access to specific lines. This would allow route-based access, reducing the need to treat the transmission grid as a single technical system. Markets for line-specific electricity transport could be created, and competing suppliers would offer line capacity to electricity traders or final consumers. These advances on the horizon suggest a radically different industry paradigm: facilities-based competition in network services. Meanwhile, rapid advances in materials science and high-temperature superconductivity could dramatically enhance the capacity of the grid, reduce losses, improve reliability, and shrink the infrastructure footprint. The deployment of high-temperature, superconducting cables would provide new solutions for high-current distribution in urban areas, offer new approaches to long-distance transmission, and render long-distance power exchanges and competition more feasible. Increased interconnections could reduce global capacity requirements by taking advantage of noncoincidental peaks.

Addressing the Systemic Problems of State Ownership

One problem with capital-intensive electric utilities is that operating costs (mainly fuel) are only about half the total costs, so utilities can underprice while still covering operating costs. With state ownership, managers and politicians alike have a shared interest in underpricing to stimulate demand and secure political support. Excess demand signals the need for investment, which managers desire and politicians take as a sign of development. Maintenance has less appeal than new investment, which can be sought to remedy poor performance and worn-out plant. If the plant

breaks down, employment to keep it struggling on can be defended, and power companies are often remarkably overstaffed as a result. The costs of overstaffing appear modest compared to fuel and capital costs, so there is little pressure to reduce staff and political incentive to increase it. But overstaffing tends to lead to inadequate salary levels, making it harder to recruit competent staff to manage maintenance and operations efficiently.

In the prereform era, international agencies were happy to fund power sector investment, as electric utilities were a visible sign of successful transfer of technology and obviously had high social returns. The cost of unserved power, even in poor countries, was high. Covenants on tariffs were agreed upon, only to be abandoned as inflationary pressures encouraged suppressing public sector prices. The result was that over time real electricity prices declined, as did profits (and hence the ability to self-finance investment). A 1989 survey of 360 electric utilities in 57 World Bank countries found that the rate of return on revalued net fixed assets had declined to below 4 percent (World Bank 1993), well below the 10 percent rate of return that international agencies normally take as the test discount rate. The revenue covered only 60 percent of power sector costs (Besant-Jones 1993). Self-financing ratios fell to only 12 percent of investment requirements in 1991 (World Bank 1993). Newbery (1993) noted similar problems for Asian developing countries. Underpriced electricity resulted in a heavy fiscal burden, estimated at $90 billion annually, or about 7 percent of total government revenues—larger than the annual power investment requirements of about $80 billion. Technical inefficiencies caused true economic losses of nearly $30 billion annually (World Bank 1994).

Several decades of studies of tariff reforms, covenants to improve pricing, and reports arguing that underpricing electricity was inefficient, fiscally harmful, and distributionally unjust appeared had little effect. Without an alternative source of investment, countries persuaded aid agencies to continue support, and the soft budget constraint reduced incentives to make politically unpopular pricing decisions. When Chile and then Britain and other countries demonstrated that privatization works, it seemed like the obvious answer to the problem—bringing financial prudence, competent management, and operational efficiency into the industry, at the same time relieving the government of heavy investment costs.

Power shortages are caused by inadequate investment and inefficient operation. The two requirements of providing incentives for efficiency and a mechanism for adequate investment are both satisfied in normal competitive markets with private owners pursuing profit. The obvious

problem with the electricity supply industry is that the transmission and distribution businesses are natural monopolies and cannot be operated as competitive undertakings. The logical solution is to separate the potentially competitive generation and supply (or retailing) from the core natural monopoly networks. Generation and supply might then operate in competitive markets, and the natural monopoly would be regulated to imitate the effect of competition.

The crucial restructuring question is how best to introduce competition into generation (and supply). The standard answer to date is that competition requires a market, and generation will therefore need a wholesale electricity market, organized either as a power exchange or as a pool. That model has worked well, given adequate G&T capacity and enough independent generating companies to ensure competition. But these conditions are very demanding and may not easily be sustainable. Although many electricity industries have been restructured successfully, they all started with substantial spare capacity. As time passes, if prices remain low because of strong competition, entry will be unattractive and capacity will become scarce. In addition, existing generating companies may wish to merge to increase their market power and deter further entry by various means.

One should therefore be rather cautious about this solution. It may be sustainable where there is sophisticated regulation of competition and regulators can find a way of ensuring adequate investment in transmission. However, California reminds us that sophisticated regulation is a scarce commodity, even in advanced countries.

Restructuring the Market: Generic Options

Four generic options can be identified for the structuring of electricity markets (Table 4.2). These options represent varying degrees of competition and customer choice (Hunt and Shuttleworth 1996):

(a) *Monopoly*—The traditional status quo: a single entity produces all electricity and delivers it over the transmission network to distribution companies or final consumers.

(b) *Single buyer*—A single purchasing agency chooses sources of electricity from a number of competing generators. It has a monopoly on the transmission networks and sells electricity to distribution companies and large power users without competition from other suppliers.

(c) *Wholesale competition*—Distribution companies purchase electricity directly from generators of their choice; deliver it under open-access arrangements over the transmission network to their service areas; and maintain a monopoly over electricity sales to final customers.

(d) *Retail competition*—All customers have access to competing generators, either directly or through a retailer of their choice, and the transmission and distribution networks operate under open-access arrangements.

Table 4.2 Structural Alternatives

	(a)	(b)	(c)	(d)
Characteristic	**Monopoly**	**Single buyer**	**Wholesale competition**	**Retail competition**
Definition	Monopoly at all levels	Competition in generation-single buyer	Competition in generation; choice for distribution companies	Competition in generation; choice for final consumer
Competing generators?	No	Yes	Yes	Yes
Choice for retailers?	No	No	Yes	Yes
Choice for final consumers?	No	No	No	Yes

Source: Hunt and Shuttleworth (1996).

Option (a) is largely a straw man from today's perspective—no one would deliberately choose it for the public interest. Options (b), (c), and (d) have the potential to progressively introduce more competition and market decisionmaking into the electricity industry and its vertical relations. Reform programs generally are designed to move from option (a) (the status quo) to options (c) and (d). Whether option (b) is a sensible transition to option (c) and at what stage option (d) is appropriate or feasible for a given country are complex policy decisions, with many important dimensions. Options (b) and (c) are considered in more detail below.

There is wide agreement on the proper sequencing of electricity reforms. Separating the network monopoly of distribution from the rest of the industry, with privatization and regulation, is a necessary first step to permit the tariff reforms that are essential to turning around the sector's performance.

Privatizing and Regulating Distribution

The system of ownership, management, and finance where reforms have not taken place leads to unbalanced tariffs; unremunerative prices, often associated with a failure to collect bills or reduce

theft; excessive costs; and an inability to sustain efficient investment. The logical place to break this vicious circle is with the key mechanism that sustains non-cost-reflective tariffs—the distribution and supply end (usually combined), which collects revenue from final consumers. The best way to both start and sustain this reform is to separate the network monopoly of distribution from the rest of the industry, privatize it, and subject it to price- or revenue-cap regulation.

A related question is whether to separate out the supply (or retailing) function from distribution, or at least to signal that this will take place in due course. This partly depends on whether a supply franchise for smaller customers (perhaps all those taking less than one megawatt or possibly 100 kilowatts) is expected to continue. For various reasons discussed below, the case for full supply liberalization is probably weak, even in industrial countries, and arguably even weaker in developing countries. If so, the natural supplier to the franchise market is the distribution company, and the main requirement is to ensure that other suppliers to eligible customers have nondiscriminatory access to the distribution network and meters. This should be written into legislation.

Privatization is not feasible without a commitment to cost-reflective tariffs, a commitment that needs effective and independent regulation to be credible. If the government is delaying irreversible reforms until the conditions are right, it should state its intention to privatize as soon as the regulatory institutions command the necessary private sector confidence. Price-cap regulation provides superior incentives for efficiency, but the cap requires periodic resetting if the efficiency gains are to be passed through to consumers. It may also need to be reset at the request of the utility if the utility is not able to finance needed investment.

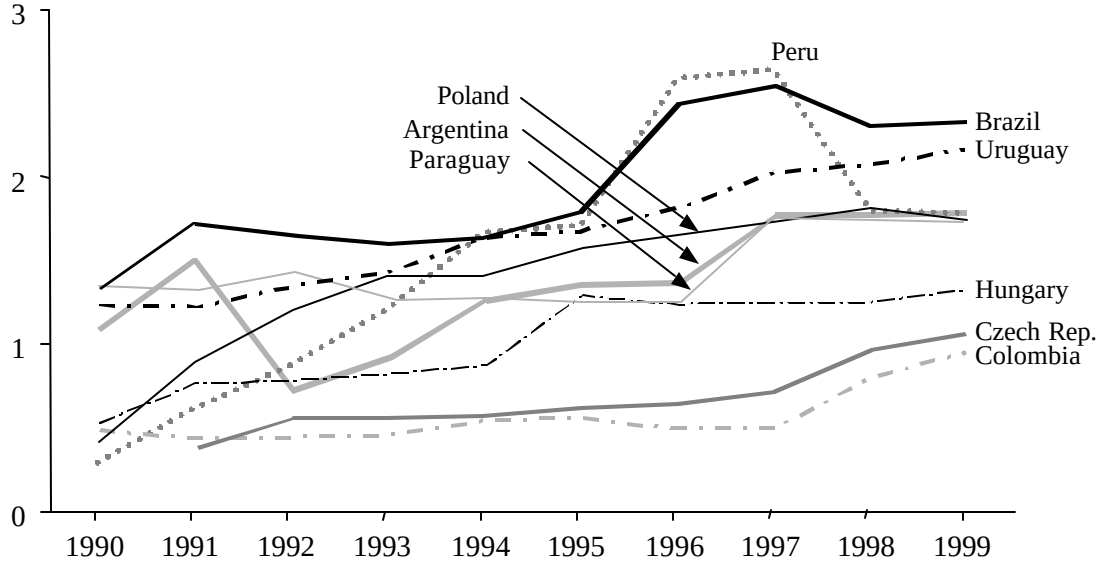
Rebalancing Tariffs: Developing countries in general face the same political opposition to increases in electricity prices as industrial countries do and have found it difficult even to maintain price rises in line with general inflation. Prices can be kept down by ignoring the capital embodied in the transmission and distribution networks and by covering the average, rather than the marginal, cost of generation, again ignoring most of the capital value of the equipment.

The margin between wholesale and retail prices can be squeezed in the medium run by effectively writing down the asset value and hence the regulatory asset base, but over time as new investment is added, the capital cost element in transmission and distribution will gradually rise. Such a gradual adjustment will be politically less painful than a sudden increase, but the cost will be reduced proceeds from the sale of the transmission and distribution companies.

Better strategies are available to ease the transition to cost-reflective prices. Many countries offer a lifeline level of sales, under which consumers pay the first 50 kilowatts per month at a subsidized rate, but for higher consumption levels pay the marginal efficient price. That way the rents associated with past investment in the network can be transferred selectively to households without removing incentives for efficient consumption at the margin. In some countries, commercial, regulatory, and eventually political pressures conspire to eliminate this lifeline element (Hungary is the most recent example, in 1999). There seems to be no reason for subsidizing industrial and commercial customers, who together probably account for two-thirds of total demand. Agricultural users represent a politically intractable problem in some countries, such as India, where the inefficiencies of underpricing electricity are more serious: socially more expensive electric pumps for tubewells may displace perfectly adequate diesel pumps.

Historically, electricity prices in developing countries included significant cross-subsidies from industrial and commercial customers to households. With open entry, such cross-subsidies are unsustainable. Indeed, in recent years, as these countries have begun to liberalize their electricity markets, cross-subsidies have been reduced and in some cases entirely eliminated (Figure 4.3). Moreover, underpricing of electricity in poor countries is far less defensible on income-distribution grounds. The main beneficiaries are invariably the richer urban dwellers, and the costs are felt indirectly by the poor, who may be deprived of the chance to get electricity at all because of the country's inability to finance the extension of the system. Electric light is substantially cheaper than kerosene or other alternatives, and consumers are willing to pay high prices for a minimum level of consumption that provides light and allows the use of a TV and modest appliances. Political support may be concentrated in urban areas, where consumption is highest. Even here, improvements in quality (avoiding blackouts and brownouts) may more than compensate for increases in prices.

Figure 4.3 Average Residential to Industrial Electricity Price Ratio, 1990–1999



Source: Jamasb (2002).

Private Involvement in Generation

The private sector can become involved in generation in two ways. The first and most common is for the government to sell a majority controlling share in existing generation companies, possibly retaining nuclear power stations or major multiuse hydroelectric dams, or both. If generation is to be privatized, the state electricity company or board will need to be subdivided into a large enough number of competing companies. The second way is for the government to invite tenders from independent power producers (IPPs) interested in supplying the (preferably restructured) state electricity company. This brings new private investment into the industry but requires only modest reform and restructuring.

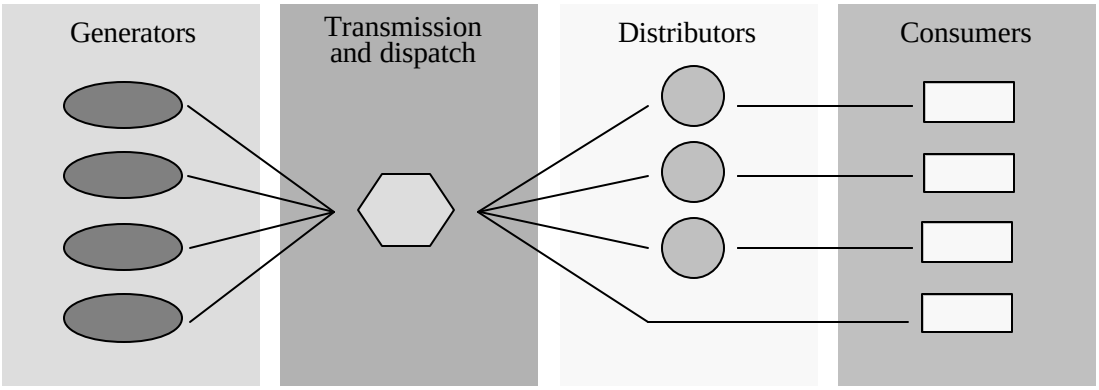
In both cases, the logical first step is to separate transmission from generation and to create the conditions for regulated third-party access to transmission. Again, transmission will need to be regulated, and the principles that apply are similar to those in distribution. But fewer problems are likely if (at least for a transition period) transmission remains in public ownership. The arguments for separation (preferably ownership separation) of transmission from generation are by now standard. A transmission company that has ownership stakes in generation is likely to favor its own generation over that of other owners. This may not be so serious where all new capacity is put up to tender auction and the transmission company acts as the single buyer. Far more serious problems

arise if the intention is to create a competitive and less heavily regulated wholesale market, with free and contestable entry (see, for example, the problems in Chile, discussed below).

There are two quite different approaches to introducing competition into generation. The first is the single buyer model (SBM), under which the transmission company (which may also be vertically integrated with generation and even distribution and supply) is the single buyer of all public electricity generated. Competition takes the form of periodic tenders for new capacity, and the winners sign long-term power purchase agreements (PPAs) with the single buyer. The second approach is to create a wholesale spot market (pool) or a power exchange, where generators can sell directly to suppliers or final buyers, or both.

Single Buyer Model: The standard SBM (Figure 4.4) is one in which the single buyer contracts directly with all generation companies for their entire output. In its extreme form, the single buyer is also the sole authorized seller of electricity, ruling out supply competition. The SBM provides the only feasible way for inviting IPPs to tender for long-term PPAs—a precondition for any private investment in generation in an otherwise not very reformed electricity sector. It can also work if the existing power stations are sold to a number of generation companies.

Figure 4.4 The single-buyer model



Source: Lovei (2000).

During the past decade, many countries in Asia, the Caribbean, Central America, and eastern Europe, and to a more limited extent in the Middle East and Africa, adopted some variant of the SBM. The obvious attraction is that it allows competitive tendering for PPAs. Long-term PPAs permit rapid entry of private finance to meet growing electricity demands, without the need for drastic restructuring of the rest of the industry. Indeed, in some cases, the tendering or negotiating

process has just been grafted onto a vertically integrated and otherwise unreformed electricity entity (for example, Pusat Tenaga, in Malaysia).

An efficient PPA would specify the availability payment (payable per kilowatt capacity when available for dispatch, possibly at different rates at different times of the year); and an energy payment (linked to the fuel price, per megawatt generated). Given these and other technical parameters, the single buyer can determine which of the tenders represents best value or least cost (given various constraints, such as fuel diversity, import dependence, or foreign exchange exposure). Competitive tendering can considerably reduce the cost of generation, particularly compared with bilateral negotiations between the incumbent single buyer and a selected generation company (Box 4.5).

Box 4.5 Competitive tender for new power capacity in Hungary

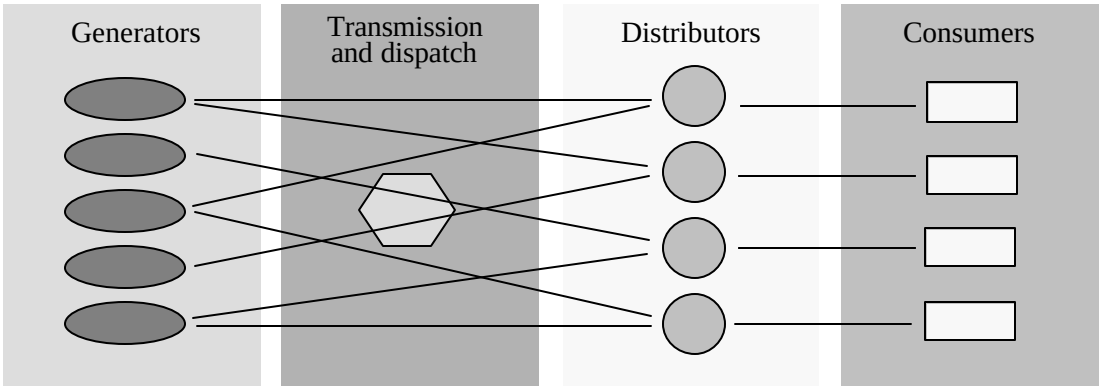
In 1997, Hungary invited tenders to build power statior of less than 200 MW for a total capacity of 800 MW Twenty-five bidders submitted 63 offers with a tot nominal capacity of 5245 MW, over six times the invite capacity. Finally, two bid were accepted: the 191 MV CCGT Tisza plant, submitted by AES Fonix Kft, and th 110 MW Kispest plant submitted by Budapest Pow Plant. The agreed average total production cost w HUF6.43/KWh in the AES project and HUF6.87/kWh i the Budapest Power Plant project. The average pric deflated by the Producer price Index to January 1997 w HUF5.69/kWh (3.38Uscents/kWh)—about 45 perce lower than that paid to the early CCGT entrants who wer selected through bilateral negotiations with MVM, th national power transmission company.

Wholesale Competition: With wholesale competition (Figure 4.5), local distribution companies retain their exclusive service territories and are free to purchase power for their customers from any competing generator. Final customers within a service area still have no choice of supplier. However, electricity users taking more than a given threshold level of power may be eligible to contract with generators. In many countries, this may involve only a few hundred or a few thousand buyers, though clearly they account for a significant fraction of total demand. By providing wholesale customers an opportunity to purchase less expensive power from alternative suppliers and by providing more customers for the IPPs, this option makes the market more competitive and more dynamic than the SBM does.

If eligible buyers are to buy from suppliers or generators, they will need a spot market or power exchange, where the buying and selling can take place, and a forward market, where market participants can contract bilaterally. Moreover, the parties will need access to the transmission and distribution systems to ensure delivery. For transmission prices to provide the needed incentives for efficient use of G&T resources, they must accurately reflect the generators' full impacts on

transmission costs, including system congestion, stability, and reliability. Also, a system operator will need to keep the frequency and voltage of the system stable.

Figure 4.5 Wholesale Competition



Source: Lovei (2000).

Contrasting the Single Buyer Model and Wholesale Competition: The risks with the SBM are considerable. If an existing single buyer also owns generation, it may preferentially select bids from its generation subsidiary or bias the competition in favor of the subsidiary. Existing single buyers are loath to face the test of competition—which may reveal the high costs of current operations—and would be well placed to impede entry by loading unreasonable conditions on entrants. Knowing this, potential entrants may be reluctant to undertake the considerable costs involved in preparing a credible bid, and this reluctance would reinforce the power of the existing single buyer. The whole purpose of opening generation to outside investors would be defeated.

Even if the single buyer genuinely opens competition to new entrants, and even if bribery and corruption can be prevented from biasing the outcome, the SBM still has two fundamental structural flaws: it delays the adoption of prices consistent with adequate revenue, and it inefficiently allocates market risk.

Revenues are defined as adequate when they are sufficient to attract enough capital for maintenance, replacement, modernization, and whatever expansion is justified by demand conditions (that is, when they are sufficient to cover the replacement cost of the services demanded). However, governments have frequently shied away from adopting prices consistent with the aim of obtaining adequate revenues. In fact, they have typically imposed price controls that subject the state-owned single buyer to considerable financial distress. In that case, the IPPs would be selling to

a monopsonist, whose financial sustainability may be suspect. Moreover, a significant portion of the IPP's investment is sunk. Understandably, the IPPs require strong assurances against ex post opportunism. Basically, the unwillingness to raise electricity prices to compensatory levels exacerbates the risks associated with making large sunk investments (a financially distressed monopsonist is more likely to renege on its promises than one enjoying a compensatory revenue stream). This creates the need to bundle IPP contracts with long-term PPAs that typically commit the government to stepping in if the state-owned single buyer is unable to honor its contractual obligations (Klein 1999). The problem to which private investment by IPPs is the solution is, after all, the inability of the existing single buyer to finance the necessary investment, which must cast doubt on its ability to service the implicit debt.

The PPAs effectively create a contingent liability for the government—the capacity availability payments typically included in the PPA have debt-like qualities. Unless these implicit or explicit contingent liabilities are managed carefully, they can undermine the government's creditworthiness and, ultimately, the country's macroeconomic stability. Thus, the SBM risks stranding contracts that complicate further restructuring, and it creates heavy debts instead of resolving the financial problems of the sector (Lovei 2000).

The SBM generally misallocates risks between foreign investors and the domestic electricity company if the latter remains in state ownership. A critical feature of the PPAs is that they typically offload demand risk onto the government through guaranteed off-take or take-or-pay clauses. The IPPs are thus effectively insulated from market-driven risks of investment value (that is, the shift in prices and quantity of electricity consumed). Clearly, the removal of such investor risk would dull incentives to choose projects effectively and use assets productively. Moreover, equity and debt investors are contractually protected, whereas consumers or taxpayers, being much less able to diversify, ultimately have to bear the full risk.

Contrast the effects of a currency crisis under the SBM with that under a well-functioning, liberalized electricity market in which the IPPs sell electricity in the spot market and under contract to distributors and large consumers. If the IPPs have confidence in the continued competitiveness of the wholesale electricity market and the liquidity of the contract market, they will feel no need to protect their investments with long-term contracts. They would normally sign a sequence of short-term contracts (one to three years) with franchise distribution and supply companies. These franchise holders would in turn contract for most if not all of their forecast demand, creating the

conditions for a sustainable contract market. Decisions about new capacity and the associated market risk could be left to private investors.

A financial crisis reduces the demand for power. A collapse in demand for electricity would almost lead to a fall in the (dollar) spot price of electricity, reducing the profits of the IPPs and possibly causing suppliers to attempt to renegotiate their contracts. If some suppliers declare bankruptcy, the financial plight of the IPPs would increase. Thus, the IPPs' fuel-supply contracts and their long-term contracts with franchise distribution companies would lose their value. Losses would be allocated, first, to providers of equity; next, to speculators of derivative contracts; and finally, to the providers of various classes of debt. There is no obvious reason for the government to guarantee the terms under which the IPPs choose to enter the market or for taxpayers to ultimately foot the bill. Moreover, the fall in spot electricity prices would benefit eligible customers buying on short-term contracts, and this would reduce the deflationary effect on demand for electricity (Klein 1999).

Reform Experience and Lessons Learned

In most developing countries, electricity reforms are still at too early a stage to provide clear evidence of their impact on social welfare. Only a handful of countries could supply time-series data of sufficient length to permit a meaningful empirical assessment. Still, several lessons can be gleaned from the experience of the countries that have gone farthest along the reform path.

Progress with Sector Reform

The main driver of the electricity reform programs in the DTEs was fiscal pressure. Although increased private participation was the common denominator, the reform strategies and the degree of success in attracting private investment show substantial cross-country and cross-regional variability.

Restructuring in the electricity industry is spreading across the developing world. Still, only a small number of countries have so far taken substantive steps to reform their SOEs. As of 1998, about 15 countries had substantially liberalized their electricity systems, and 55 countries had some liberalization under way or planned. A significant portion of these reforming countries were mature industrial economies. Of the 81 countries that had not taken any steps to reform the sector, many were developing countries (Bacon and Besant-Jones 2001). Even in Latin America, the region that

led the growth in private sector participation in electricity, the reform movement is far from complete (Table 4.3). As of 2001, in many countries of that region, the state still controlled significant portions of the industry's various activities (Millan, Lorca, and Mico 2001).

Table 4.4 presents a "scorecard" for regional reform as of 1998, based on a questionnaire (Bacon and Besant-Jones 2001) that asked how many of the following steps had been taken in a given country:

- The electric utility has been commercialized and corporatized.
- An energy law permitting creation of a sector that could be unbundled or privatized, in part or in whole, has been passed by parliament.
- A regulatory body, separate from the utility and the ministry, has started work.
- The private sector has invested in greenfield sites that are operating or under construction.
- The state-owned utility has been restructured or separated.
- Any of the existing SOEs has been privatized (outright sale, voucher privatization, or joint venture).

Table 4.3 Private Sector Participation in Latin America (percentage)

	Generation	Transmission	Distribution
Argentina	60	100	70
Bolivia	90	90	90
Brazil	30	10	60
Chile	90	90	90
Colombia	70	10	50
Ecuador	20	0	30
El Salvador	40	0	100
Guatemala	50	0	100
México	10	0	0
Paraguay	0	0	0
Peru	60	20	80
Uruguay	0	0	0
Venezuela	20	10	40

Source: Espinasa (2001).

Table 4.4 Number of Countries That Have Taken Key Reform Steps, by Region, 1998
(number of countries [percentage])

	AFR		EAP		ECA		LAC		MENA		SA	
	(n=48)		*(n=9)*		*(n=27)*		*(n=18)*		*(n=8)*		*(n=5)*	
Corporate	15	(31)	4	(44)	17	(63)	11	(61)	2	(25)	2	(40)
Law	7	(15)	3	(33)	11	(41)	14	(78)	1	(13)	2	(40)
Regulator	4	(8)	1	(11)	11	(41)	15	(83)	0	(0)	2	(40)
IPPs	9	(19)	7	(78)	9	(33)	15	(83)	1	(13)	5	(100)
Restructuring	4	(8)	4	(44)	14	(52)	13	(72)	3	(38)	2	(40)
Generation privatization	2	(4)	2	(22)	10	(37)	7	(39)	1	(13)	2	(40)
Distribution privatization	2	(4)	1	(11)	8	(30)	8	(44)	1	(13)	1	(20)
Reform indicator	0.88	(15)	2.44	(41)	2.70	(45)	4.28	(71)	1.00	(17)	3.00	(50)

Note: EAP: East Asia and the Pacific; ECA: Europe and Central Asia; IPP: independent power producer; LAC: Latin America and the Caribbean; MENA: Middle East and North Africa; SA: South Asia.
Source: Energy Sector Management Assistance Program data.

Out of a maximum reform score of 6.00 (where all reform steps were taken) the average score was 4.28 for Latin America and the Caribbean, 3.00 for South Asia, 2.70 for Central and Eastern Europe and Central Asia, 2.44 for East Asia and the Pacific, 1.00 for the Middle East and North Africa, and 0.88 for Africa.

The degree of private sector interest has been markedly mixed across countries and regions, to a large extent reflecting the above differences in reform effort. Between 1990 and 1999, more than $160 billion was invested in private power projects in developing countries. Of this, almost 40 percent went to Latin America and the Caribbean; about 35 percent, to East Asia and the Pacific; just more than 3.5 percent, to the Middle East and North Africa; and less than 2 percent, to Sub-Saharan Africa. The considerably lower levels of private investment in the latter two regions reflect the lower levels of reform.

The trend of private sector participation during the 1990s was also rather uneven. Table 4.5 reveals a clear divide between pre-1997 and post-1997 private investment, reflecting sensitivity to sudden changes in the economic climate, particularly currency fluctuations such as experienced in Asia and Latin America. From the beginning of the 1990s until 1997, electricity sector reforms and anticipated economic growth spurred private investment in the sector. After 1997, however, a series of financial problems in many countries in Asia, Eastern Europe, and Latin America led to a sharp

decline in investment in these regions. Whether the decline will persist is difficult to predict (Jamasb 2002).

Table 4.5 Private Investments in Electricity Projects in DTEs, 1990–1999

(1998 US dollars, millions)

Region	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
SSA	49	0	27	1	84	42	1,014	503	709	455	2,884
EAP	55	454	4,622	5,592	7,291	7,492	11,677	12,437	4,833	1,945	56,398
ECA	85	0	1,041	0	1,332	3,369	3,507	2,128	504	688	12,655
LAC	1,204	23	2,497	3,298	2,924	5,788	8,750	20,629	12,720	6,287	64,120
MENA	0	0	0	0	225	0	217	4,679	0	715	5,837
SA	169	735	37	1,186	3,081	3,193	4,934	2,319	926	2,227	18,805
Total	**1,562**	**1,212**	**8,225**	**10,077**	**14,936**	**19,884**	**30,100**	**42,694**	**19,692**	**12,317**	**160,698**

Note: DTEs: developing and transition economies; EAP: East Asia and the Pacific; ECA: Europe and Central Asia; LAC: Latin America and the Caribbean; MENA: Middle East and North Africa; SA: South Asia; SSA: Sub-Saharan Africa.

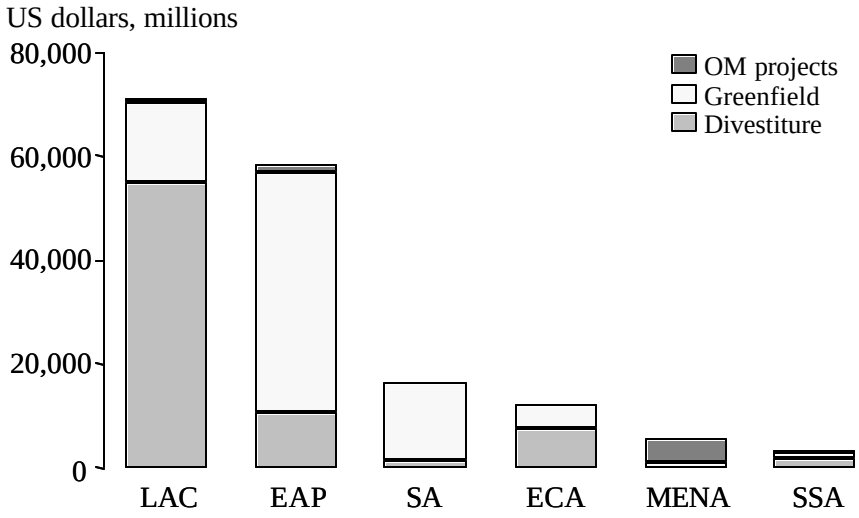
Source: World Bank Private Participation in Infrastructure Database.

Significant cross-country and cross-regional differences can be seen in reform strategies adopted. Several Latin American countries (Argentina, Brazil, Bolivia, Chile, Colombia, Peru) restructured and unbundled their electricity systems and created wholesale electricity markets. The same approach is slowly being adopted in Eastern Europe (Bulgaria, Hungary, Romania) and the former Soviet Union (Armenia, Estonia, Georgia, Latvia, Moldova), although other approaches are also emerging:

- Reform limited to IPPs (Croatia, the Slovak Republic)
- Third-party access to a dominant utility (the Czech Republic)
- Restructuring with plans for major divestitures (Poland, the Russian Federation, Ukraine).

Asian countries have adopted variants of the SBM and invited private investment in generation through IPPs, with negligible restructuring and reform (Bangladesh, China, India, Indonesia, Malaysia, Nepal, Pakistan, the Philippines, the Republic of Korea, Sri Lanka, Thailand, Vietnam). The model of IPPs selling to state-owned utilities was adopted by countries in Central America and the Caribbean (Belize, Costa Rica, the Dominican Republic, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama); in the Middle East and Africa (Algeria, the Arab Republic of Egypt, Côte d'Ivoire, Ghana, Jordan, Kenya, Morocco, Senegal, Tanzania); and in South Asia. As a result, about 80 percent of the private investment in countries of Latin America and the Caribbean, Europe, and Central Asia have been in divestiture projects; and 80 percent of the private investment in the East Asia and Pacific region and South Asia has been in greenfield projects (Figure 4.6).

Figure 4.6 Types of Private Sector Participation in DTEs



Note: EAP: East Asia and the Pacific; ECA: Europe and Central Asia; LAC: Latin America and the Caribbean; MENA: Middle East and North Africa; SA: South Asia; SSA: Sub-Saharan Africa.

Source: World Bank Private Participation in Infrastructure Database.

The top 12 countries listed in Table 4.6 accounted for about 83 percent of the $161 billion invested worldwide in the electricity sector during the 1990s. Some countries have had notable success in attracting private investment in all segments of the industry (for example, Argentina and El Salvador). However, private investors have shown little interest in purchasing SOEs or in financing *de novo* infrastructure assets in Mexico, Turkey, and Ukraine, to name but a few examples. Indeed, some countries, including Hungary and Venezuela, have had to postpone planned privatization programs because of a lack of investor interest. Despite substantial state encouragement of private capital inflows, these countries have been unable to reverse sustained periods of underfunding.

Table 4.6 Countries with Highest Private Investments in the Electricity Sector, 1990–1999

(1998 US dollars, millions)

Brazil	31,627	Malaysia	5,970
China	19,049	Morocco	4,820
Argentina	14,986	Korea, Rep	4,522
Philippines	11,672	Turkey	3,710
Indonesia	9,580	Peru	3,680
India	8,881	Hungary	2,446
Chile	6,836	Russian Fed	2,070

Pakistan	6,693	Kazakhstan	1,508
Colombia	6,512	Czech Rep.	1,300
Thailand	6,413	Guatamala	1,296

***Source*: Jamasb (2002).**

The Standard Reform Model and its Outcomes

A standard reform model in the electricity sector has emerged, which separates potentially competitive parts from the core natural monopoly (transmission and distribution), with a regulatory agency setting the transmission and distribution tariffs. Competing generators offer electricity to the wholesale market, eligible customers are free to choose their supplier, and new entrants build new capacity with nondiscriminatory access to the grid and to final customers. Latin America is not only where the first reforms started—in Chile—but also where the standard model has been most influential and far-reaching (Suding 1996; Millan, Lorca, and Mico 2001). The reforms in Chile (1982) were followed by reforms in Argentina (1992); in Peru (1993); in Bolivia and Colombia (1994); in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama (1997); and more recently in Brazil, Ecuador, Mexico, and Venezuela (Rudnick and Zolezzi 2001). How well has this system worked?

Achievements of Liberalization in Latin America

The sequencing of reforms in Chile is instructive: the creation of the regulatory framework and the restructuring of the sector occurred first, to give the reorganized enterprises some experience with the regulatory regime before privatization. Privatization proceeded slowly, avoiding some of the risks of underpricing with large transfers to shareholders, while wide share ownership created political support for the new system (Bitran and Serra 1998). Thus, Chile's approach was sensibly cautious. Moreover, its progress has been of enormous significance in demonstrating the feasibility of private sector involvement in the electricity sector of developing countries, and has provided valuable lessons for subsequent reforms around the world.

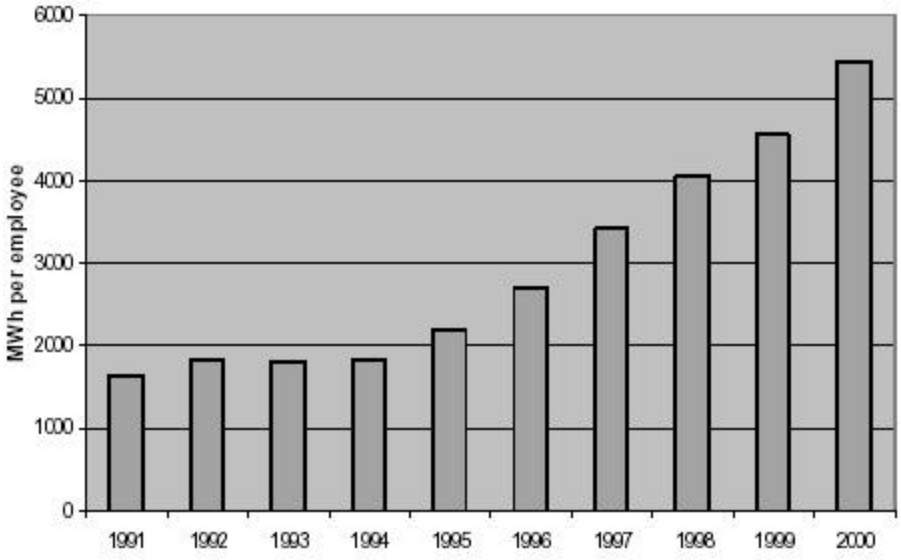
The objectives of restructuring in Chile included vertical and horizontal unbundling; competition in generation; a centralized pool; open access to the transmission network; yardstick competition in distribution; and for large users, the freedom to purchase their power from any generating or distribution company. By 1991 Chile had 11 generating, 21 distribution, and 2 integrated

companies. However, a key exception to the unbundling was the retention by Endesa (Empresa Nacional de Electricidad, S.A., the largest generator) of the ownership and operation of the high-voltage grid in the country's main power system (Lalor and Garcia 1996). Endesa and its affiliates control more than 60 percent of that system's installed generating capacity, and its parent owns the largest distribution company, accounting for more than 40 percent of distribution.

The post-reform market structure in Chile was not conducive to competitive neutrality—Endesa could handicap potential competitors through its control of the bottleneck transmission facilities. The other reformers learned from Chile's mistakes, and most other reforming countries (for example, Argentina, Bolivia, and Peru) introduced restrictions on cross-ownership. Argentina and Bolivia sought to reduce horizontal market power by limiting the maximum market share in generation to 10 and 30 percent, respectively (Watts and Artizia 2002). Argentina, by the end of 1993, had 70 firms trading in the bulk supply market; by 1997, it had 40 generating and more than 20 distribution companies (Rudnick 1998).

One of the primary benefits of the restructuring is that political intrusion into price setting has been reduced. Prices are now aligned with underlying costs and reflect resource scarcity, as efficiency requires, and have been on a downward trend in some countries as a result of the efficient exploitation of regional gas networks and new production technologies (mainly CCGT). In Argentina, for example, the monthly average price per megawatt hour in the wholesale electricity market fell steadily from about $45 (with peaks of more than $70) to about $15 in 1997. Despite the fall in prices, 4,927 megawatts of net additional capacity was added to the system, while available capacity increased from 5,930 megawatts in 1992 to 13,530 megawatts in 1997. Similarly, in Chile, wholesale and final prices fell by 37 and 17 percent, respectively, between 1986 and 1996. Although prices are close to marginal costs, the companies have made reasonable profits (the rate of return of the main distribution company rose from 10 percent to 35 percent in the same decade) and have been willing to invest in new hydro capacity, as well as in transmission and distribution (Spiller 1996).

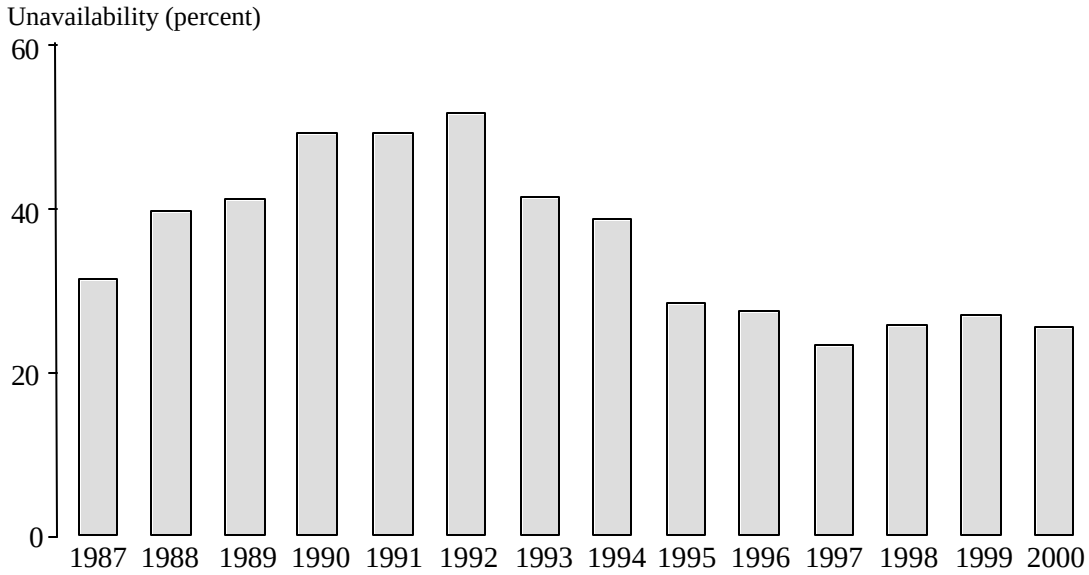
Figure 4.7 Labor Productivity of the Distribution/Supply Businesses in Brazil, 1991–2000



***Source*: Mota (2003).**

Overall, physical performance of the generating plant, transmission, and distribution improved dramatically with deregulation and privatization. Chile's Endesa more than doubled its output between 1987 and 1997 and reduced the number of its employees from more than 3,000 to fewer than 1,700; and the number of clients per employee rose from 376 to more than 700. Thus, the enterprise more than doubled its labor productivity (Alexander and Estache 2000; Rudnick 2000). Argentina's labor productivity (gigawatts per employee) increased more than 23 percent in the first five years of the reform (Estache and Rodriguez-Pardina 1999). Similarly, growth in labor productivity of the distribution/supply companies in Brazil accelerated after privatization (Figure 4.7). From 1994 to 2000, the total number of employees was halved and productivity increased by an impressive 147 percent (Mota 2003).

Figure 4.8 Thermal Plant Unavailability in Argentina, 1987–2000

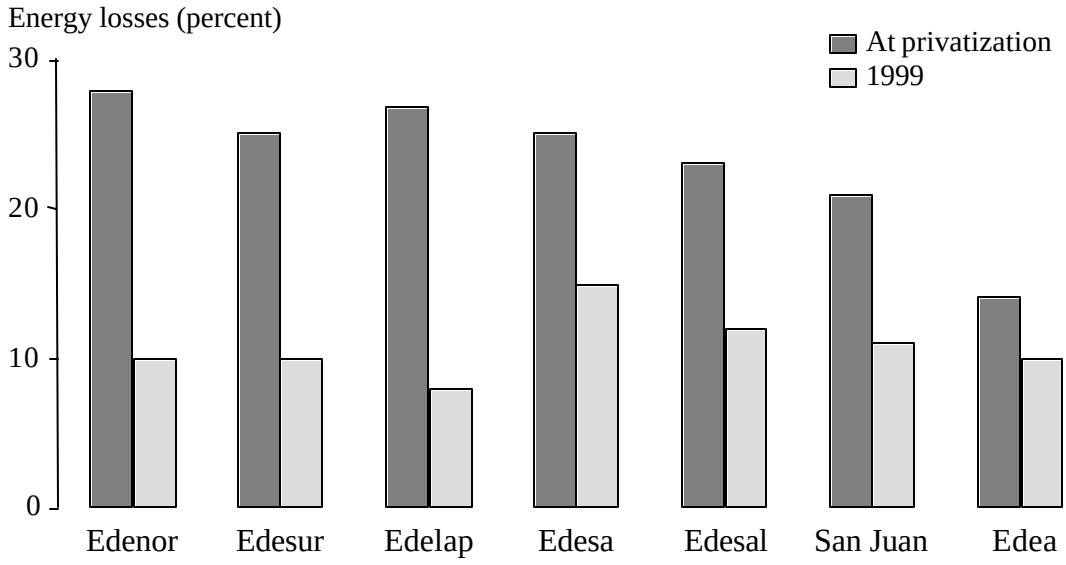


***Source*: Rudnick and Zolezzi (2001).**

The impact of reforms on the quality of service has been equally remarkable. In Chile, average time for emergency service declined from five hours in 1988 to two hours in 1994. In Argentina, thermal plant unavailability decreased from 52 percent in 1992, when most of the generating capacity was privatized, to 26 percent in 2000 (Figure 4.8) (Rudnick and Zolezzi 2001). In Brazil, in the first four years after privatization, the outage duration per customer decreased by more than 55 percent in Light (the distribution company in Rio de Janeiro) and by 40 percent in Enersul (its counterpart in the state of Mato Grosso do Sul). In the same period, the outage frequency per customer fell by 60 percent in Light and 25 percent in Enersul.

Energy losses, theft included, have shrunk considerably, declining in Chile from 20.9 percent in 1986 to 8.6 percent in 1996 (Fischer and Serra 2000). Similarly, in Argentina, the privatized distribution companies have all succeeded in substantially reducing their distribution losses (Figure 4.9). For example, in 1993, Edenor's losses totaled 26.2 percent of all distributed electricity; in 2000, this value had been reduced to only 10 percent (Edenor 2001). Technical losses in transmission decreased from 5.7 percent in 1992 to 4.4 percent in 2000.

Figure 4.9 Distribution Losses in Argentina, at Privatization and in 1999



***Source*: Feler (2001).**

By relaxing the financial constraints faced by SOEs and establishing a stable and fair regulatory regime, the reforms accelerated network expansion. In the prereform period, coverage in Peru

increased slowly, from 44.3 percent in 1986 to only 48.4 percent in 1992 (Figure 4.10). During the five years following the reforms, service expansion accelerated considerably, and by 1997 coverage was more than 68 percent (Rudnick 1998). Network expansion has benefited the poor: in the lowest income per capita decile in Chile, the proportion without an electricity connection fell from 29.4 percent in 1988 to 7.0 percent in 1998; in the second lowest decile the proportion fell from 19.9 percent to 4.0 percent (Estache and others 2000). A rural electrification program, with competition, private investment, and decentralized decisionmaking, was launched in 1994. One of the most innovative elements of this program was the extent to which it relied on competition among distribution companies for the efficient implementation of the projects; and among regions, on competition for the funds provided by the central government. Coverage in rural areas increased from 53 percent in 1992 to 76 percent at the end of 1999, exceeding the target of 75 percent originally set for 2000 (Figure 4.11).

Figure 4.10 Electricity Coverage in Peru, 1986–1997

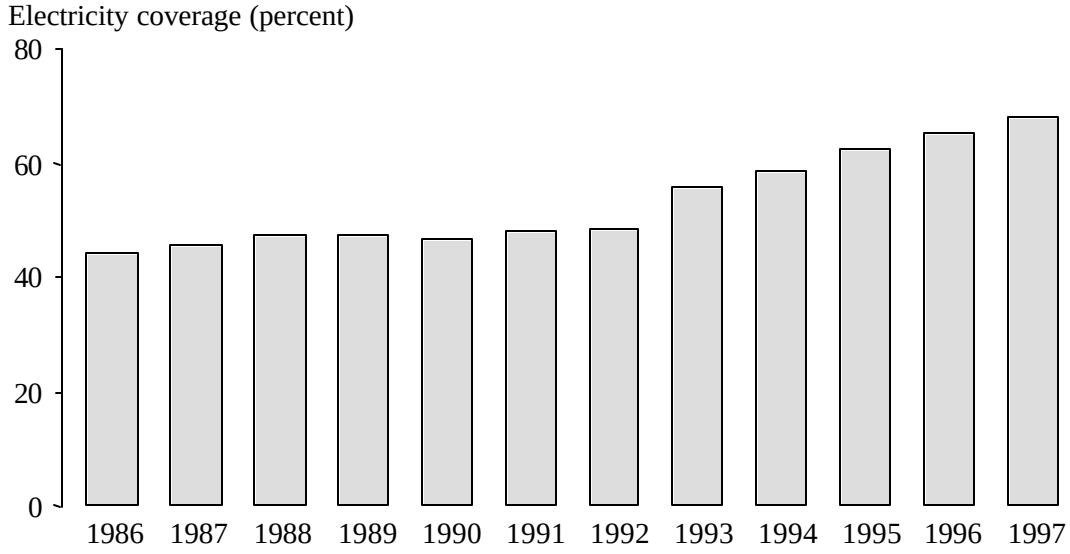
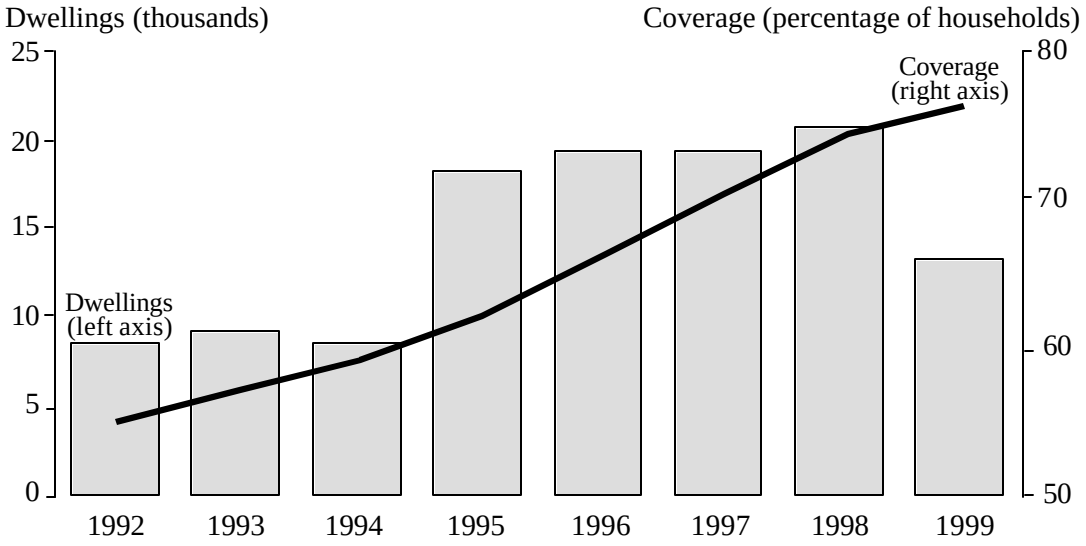


Figure 4.11 Rural Dwellings Obtaining Electricity and Rural Electricity Coverage in Chile, 1992–1999



Note: Data for 1999 are estimates.

Source: Chile, National Energy Commission (1999).

The Asian Crisis and Structural Deficiencies of the Single-Buyer Model

The Asian financial crisis has called into question the strategy of promoting rapid entry of private finance into an otherwise unreformed electricity sector by means of IPPs selling to a state-owned utility under long-term PPAs.

Power Shortages in Southeast Asia: Several factors conspired to create acute power shortages in the Southeast Asia during the late 1980s and early 1990s, especially in Indonesia, Malaysia, the Philippines, and Thailand. These countries experienced rapid economic growth and consequently substantial increases in demand for electricity, but the public spending that had fueled much of that growth left the central governments unable to finance the needed expansion in electricity and other areas of physical infrastructure. For example, an investment of more than $40 billion is needed to meet Malaysian peak demand, expected to rise from 4.5 gigawatts in 1992 to 35.4 gigawatts by 2020 (Power Asia 1993). Similarly, it was estimated in 1990 that Indonesia needed $20 billion to install 12 gigawatts of additional capacity by 2000, but a revised forecast in 1993 called for an additional 12 gigawatts of capacity within five years. Thailand's electricity consumption grew at an average annual rate of 14.1 percent in 1990–1997. But its installed capacity grew at an average

annual rate of only 7.7 percent. Indonesia's electricity demand had grown at an average annual rate of 17 percent for several years before 1991, but its installed capacity grew at an average annual rate of only 15.3 percent. In the Philippines, excess demand in 1992 corresponded to 48 percent of total system capacity, and Malaysia's annual average reserve margins had fallen to 19 percent, far below the desired level of 30–40 percent for rapidly industrializing economies.

Seeking rapid relief from these acute supply shortages, countries in the region encouraged the entry of IPPs by offering them long-term PPAs with state-owned, single-buyer utilities. The PPAs typically involved payment in dollars and required government guarantees, as default proceedings against a state-owned utility are not normally allowed. The strategy was very successful. Southeast Asia attracted $65 billion between 1990 and 1997, more than half the total for developing countries and substantially ahead of the only other major destination, Latin America (with $45 billion).

Impact of the Financial Crisis: The financial crisis that started in Southeast Asia in 1997 had a dramatic negative effect on the exchange rate, as well as on GDP growth rates and hence on electricity demand. The collapse in currencies caused a doubling in the domestic cost of electricity under the PPAs, which the state-owned power company was reluctant to pass on to final consumers. In the Philippines, for example, the foreign debt of the national power corporation rose to more than 20% of the total national debt (World Bank 1999). The fall in demand for electricity created strong pressures to renege on, delay, or renegotiate PPAs, causing foreign investors to lose confidence.

It became painfully clear that this form of private investment in power generation is equivalent to an expensive foreign debt. The terms of the PPAs may conceal the true cost of the debt, but the interest rates are inevitably high because of the source of finance and the risk. Private investors inevitably borrow at higher interest rates than institutions like the World Bank, even in stable markets, and lending to state enterprises in corrupt economies is perceived as particularly risky by foreign investors. Some governments attempted to repudiate the debts entered into by their predecessors, often on claims of corrupt dealing, while other governments had to reschedule their loans, if not default. This form of private involvement neither led to much restructuring of the sector nor addressed the underlying problem of non-cost-reflective tariffs — if anything, the currency crisis seems to have made this worse.

Problems of Market Power with Excess Demand

One of the primary virtues of unbundling in the network utilities is that regulation can be confined to the natural monopoly segments while in the competitive or contestable activities regulatory intervention can be eliminated. In the case of the electricity sector that would be a mistake because even the potentially competitive elements are vulnerable to market power (Newbery 2002). Even in some large industrialized countries where there was an opportunity to create several private generators of approximately equal size, the actual market structure of generation tends to be highly concentrated. The problem of market concentration in generation is far more pronounced in a large number of DTEs because of the small size of their electricity markets (Table 4.7). For example, in the Czech Republic, the largest power producer controls 75 percent of the country's total generating capacity (Bacon and Besant-Jones 2002). Thus, there is need for continued regulatory oversight to ensure that the wholesale markets are not manipulated. Indeed, almost every organized electricity market around the world has in place some form of a price or revenue cap.

Table 4.7 Share of the three largest firms (2000)

	Generation	Transmission	Distribution
Argentina	30	80	50
Brazil	40	60	40
Chile	67	100	50
Colombia	50	100	60
Peru	100	100	100
Bolivia	70	100	70
El Salvador	83	100	88
Panama	82	100	100
Hungary	74	100	65
Poland	45	100	21
Czech Republic	71	100	49
Pakistan	95	100	100
Thailand	100	100	100
Malaysia	62	100	97
Indonesia	100	100	100

Source: Jamasb (2002)

Where wholesale markets have worked well in developed economies it has been in large part because of excess generating capacity, modest demand growth, and the availability of cheap new plant that allows independent power producers to enter at modest scale, putting downward pressure on wholesale prices. California has demonstrated that tight demand, low contract coverage, and a liberalized wholesale market can lead very rapidly to high prices and bankruptcy (Box 4.6). That raises the obvious question, whether competitive markets can work as well in developing countries suffering from a shortage of capacity, current excess demand and forecast rapid demand growth? The answer will depend critically upon the existence of credit-worthy electricity buyers (ideally suppliers) willing to enter into longer term contracts on the back of which new investment in generation can be financed. This is turn requires satisfactory pricing of transmission and distribution to ensure that the power can be delivered from the generator to the customers. If capacity is scarce, then the spot price in a competitive market can rise to very high levels.

Box 4.6 Lessons from the California experience

What lessons can be drawn from the Californian experience for electricity reform?

First, tight electricity markets, where the reserve margin falls below 10%, are likely to lead to volatile markets and high prices even if they are fairly competitive (meaning that there are four or more generating companies competing with each other at the margin of supply). As demand tightens relative to supply, inelastic and unresponsive demand means that large price rises have little effect on demand, but each supplier has increasing and eventually very considerable market power. The large increase in price caused by any single company withdrawing a small amount of capacity is more than sufficient to compensate for the loss of profit on that volume of sales, making such withdrawals highly profitable in tight markets.

Second, any transition from a vertically integrated utility to an unbundled structure introduces price risks between generators and suppliers that previously cancelled out. High wholesale selling prices for generators gives profits upstream that are matched by the losses of downstream suppliers who have to buy at these high wholesale prices and sell at predetermined retail prices, unless these purchases are hedged by contracts. The transition to (and subsequent operation of) an unbundled industry therefore needs contracts and hedging instruments to insure against possible unexpected events that can have dramatic effects on spot prices, particularly when suppliers sell on fixed price terms. The British privatization was accompanied by three-year contracts for both sale of electricity and purchase of fuel to reduce transitional risks.

Third, in an interconnected system operating under a variety of different regulatory and operational jurisdictions, spare capacity is a public good that may not be adequately supplied unless some care is taken to ensure that it is adequately remunerated. Fourth, it is even harder for a decentralized market under multiple jurisdictions to ensure adequate reserve capacity with a potentially energy-constrained hydroelectric system, particularly where reservoir storage is limited, and annual water volume variations are high. Finally, uncoordinated and injudicious regulatory interventions in such an interconnected system can have perverse local effects, and very damaging impacts on the efficient pattern of inter-regional electricity trade

***Source*: (Wolak and Nordhaus 2000, 2001).**

Provided franchise customers are adequately covered by contracts, which can be imposed upon existing state-owned generators at the time they are unbundled, high spot prices have the desirable advantage of signaling the attraction of entry and encouraging consumers to sign contracts to

support and finance entry. They also efficiently ration scarce supply to consumers most willing to pay the high spot prices, and motivate them to seek out more attractive longer term arrangements. They therefore provide finance at the margin where it is needed without necessarily raising average prices to all consumers. Markets, contracts, and well-regulated transmission and distribution charges therefore represent a significant improvement on a situation of power interruptions, underpriced electricity and an inability to finance the generation that is needed.

Nevertheless, although market power may be restrained in the short term through contracts, it will reappear when these contracts are due for renegotiation, at least if the generators are privately owned and cannot be coerced to sign new contracts. Market power depends on the number of competing generators and the overall degree of market demand relative to capacity. If demand is inelastic, and if all remaining generators cannot meet that demand, the remaining generator has considerable market power. In a competitive wholesale market, each generator will be aware of that power, and will offer at least marginal output at a high price. Investment in response to the excess demand and high prices will reduce this market power if there are sufficiently many independent generating companies, but not if there are too few, at least until enough entry has taken place to alter the number of price-setting generators.

Relying on contracts alone may not be sufficient to address issues of market power, and it is important that the regulator has sufficient power to address market power issues as well as setting the price-caps or tariffs in the regulated natural monopoly sectors. The dictum of confining regulation to the natural monopolies has often been taken too literally, paying too little attention to the unnatural, or at least undesirable, monopolies in generation.

CHAPTER FIVE

The Water Sector

The water sector has two distinguishing features that set it apart from other infrastructure: the supply is location-specific and finite; and safe water is critical for life and health, hence its availability and affordability at adequate quality to the entire population takes on great welfare (and political) importance (ADB, 2000). These features, combined with other basic economic and technological characteristics of the water sector, define a somewhat limited range of institutional options that can be applied, create specific regulatory challenges, and raise the significance of the water sector in meeting social and economic development objectives—especially poverty reduction and environmental sustainability.

Since the early 1990s there has been increasing recognition internationally that water should be managed as an economic good, and that its scarcity value requires policies and institutions that can achieve economic and financial sustainability of water provision (WMO, 1992). At the same time, the inclusion of a water access target among the Millennium Development Goals[8] underscores the sector's close connection to social equity. The challenge for regulatory reform is to meet both efficiency and social welfare objectives in the water sector—balancing needs of operators, consumers, taxpayers, and the environment.

The state of the water sector is far from what it needs to be in developing countries and in many transition economies, both in terms of service delivered and of system efficiency. Globally 1.1 billion people are without access to "improved" water supplies (X percent of the rural population and 6 percent of urban), and 2.4 billion are without "improved" sanitation (X percent of the rural population and 14 percent of urban), according to WHO/UNICEF (2000). However, these averages are misleading since they do not consider the quality, regularity, affordability or convenience of service—for example, an urban slum dweller is counted to have "access" if there is a public tap or public latrine within 100 meters of the home, although it may be shared with hundreds of other

[8] "To halve between 1990 and 2015 the proportion of people without sustainable access to safe drinking water". (United Nations, Millennium Summit, September 2000). The World Summit on Sustainable Development (September 2002) added another target: "To halve the proportion of people without access to adequate sanitation by 2015."

residents (IIED, 2003).[9] In the rapidly growing and smaller cities of low income countries, half or more of the residents (many of them living in informal and periurban settlements) do not have water connections (Hewett and Montgomery, 2002). One major reason for this inadequate coverage is that water utilities, which serve mainly medium-to-larger urban settlements, are often highly inefficient in developing and transition economies. Water losses (unaccounted for water, both technical and commercial) exceed one-third of production in many systems; staffing levels per connection are many times what is considered good practice in the industry; tariff revenues do not cover operating costs; the piped water flow and pressure are inconsistent, and the quality frequently unsafe to drink.

Faced with such inadequate service and an inability to sustain fiscal support to finance the necessary expansion and rehabilitation of systems, especially in the context of high unmet demand and often deteriorating water resources, many countries and cities have embarked on various paths of reform. Structural and policy changes in the water sector have been slower, less sweeping and more difficult to sustain politically than those in other infrastructure sectors. Although the scope for improved performance is clearly significant, the economic and technological characteristics of the sector allow no institutional "magic bullet" promising major efficiencies. Ultimately, designing and sustaining effective reforms in this sector depends critically on managing the political agenda.

The Economics of Water Supply

The Nature of Supply and Demand

The supply characteristics are determined most importantly by the basic water resources—location, quantity and quality of freshwater relative to competing demands in a given population area for uses including agriculture (which typically commands 80-90 percent of all water use), industrial and municipal needs, hydropower, and the often ignored ecological requirements (such as retaining wetlands). The relevant geographic radius of natural supply for these demands is determined by the

[9] For the urban population alone, an estimate of the numbers of people lacking "adequate" provision (sufficient in quantity and quality, given actual population densities) in Africa, Asia and LAC amounts to 0.7-1.0 billion for water and 0.8-1.1 billion for sanitation—compared to 0.1-0.5 billion based on WHO/UNICEF "improved" standard. (IIED, 2003)

costs of transporting surface water or pumping from aquifers.[10] The sustainability of a water resource system depends on whether current extraction rates (net usage, including the maintenance of water quality remaining in or returned to the source) is less than the inflow. The initial quality of the water source determines the expenditure needed for treatment before use. An increasing number of countries are experiencing an economic water scarcity, meaning that the costs of capture, treatment and transport would make supply and distribution unaffordable (World Bank 2002). For most developing countries, the supply issue is not absolute scarcity but deteriorating quality of the raw resource and lack of connections for the growing population, especially for low income households, and unreliable service both to households and firms (ADB, 2000).

Competition for water among users and sectors of economic activity is often intense and rising with population growth, urbanization, and industrialization. Many countries do not recognize private ownership rights over water supply but do recognize use rights, which are the focus of legal and institutional protections. The urban water demand has both quantity and quality implications: most population growth is urban and urban users demand improved quality, while at the same time urban-based industrial and household discharges can deteriorate the quality of water sources unless properly disposed of or treated (Saleth and Dinar, 1999). The recognition of sharpening demand competition has led policy and institutional reforms in many countries to focus increasingly (though not nearly enough in most cases) on issues of allocation, such as tradable water rights; on strategies of decentralized water management and control (while recognizing the need for integration and coordination across jurisdictions and user groups); and on ensuring both the economic viability and physical sustainability of water provision.

Because water supply is essential for life, at a certain minimum level of consumption demand is price inelastic. However, the actual minimum supply required to sustain life and health is very small (the WHO guideline is 25 liters per capita per day), far below the level of consumption subsidized in many countries where lifeline tariffs may extend up to 30 m3/month per connection (about 200 lpcd for a household of 5 persons) (Boland and Whittington, 2000).

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[10] Even where raw water appears abundant, its effective availability to a water utility is constrained by initial quality, by pumping and transport costs, and by claims for competing uses. New fresh water supply can be "created" by desalination, the costs of which have fallen sharply (to US$0.47 per cubic meter with technology available in 2000, compared to a low of about US$1.60 in 1996 (Tynan 200)). Even so, desalination is limited by location and 80 percent of total desalination output in the world is produced by the Persian Gulf states. Reuse of treated wastewater is another means of augmenting freshwater supplies and is common in water scarce countries especially in the Middle East (Haddadin, 2002).

Even in the poorest urban areas many water uses are not for subsistence, and so consumption is somewhat price elastic (with estimates for developing countries ranging from -.25 to -.7). Therefore demand management, especially to reduce waste under users' control, is a relevant policy objective. (Noll, Shirley and Cowan, 2000)

Because they are typically underserved by formal providers, the poor often pay extremely high rates and shares of their income for their water needs, much above the levels spent by the better-off, while consuming much less (Crane 1994). (Table 5.1) Where the utility water is of poor quality, even middle-upper income households purchase from vendors. (Komives, Whittington and Wu, 2001) The willingness to pay for water is variable even for the poor (reflecting desired quality and convenience) and is an important factor that must be assessed to provide a financially sustainable system. Although there is ample evidence linking adequate water supply and quality, when combined with sanitation, to health outcomes (Esrey 1996), the private consumer's valuation of safe water quality, and especially of sanitation's health benefits, may be less than the social value in terms of public health. This implies that incentives (pricing structures and sometimes user subsidies), coupled with public education, may be needed to ensure a socially desired level of minimum consumption.

Table 5.1:
Ratio between Prices Charged by Vendor and by Public Utilities

Country	City	Ratio
Bangladesh	Dacca	12-25
Colombia	Cali	10
Ecuador	Guayaquil	20
Haiti	Port-au-Prince	17-100
Honduras	Tegucigalpa	16-34
Indonesia	DKI Jakarta	4-60
	Surabaya	20-60
Ivory Coast	Abidjan	5
Kenya	Nairobi	7-11
Mauritania	Nouakchott	100
Nigeria	Lagos	4-10
	Onitsha	6-38
Pakistan	Karachi	23-83
Peru	Lima	17
Togo	Lome	7-10
Turkey	Istanbul	10
Uganda	Kampala	4-9

Source: "Water Resources Policies and the Urban Poor: Innovative Approaches and Policy Imperatives." Ramesh Bhatia and Malin Falkenmark. Water and Sanitation Currents. UNDP World Bank

Economic features of the sector

High fixed costs

The economic and technological characteristics of the water sector determine pricing and organizational alternatives, and the rationale for regulation. The first of these characteristics is the

structure of costs. Water delivery systems have four components[11]: capture of the natural resource supply (e.g. reservoirs, wells), transportation (e.g. aqueducts and mains, the primary network), treatment to ensure adequate quality for use, and delivery to users (the secondary network of pipelines and taps) (Noll, Shirley and Cowan, 2000). All of these components require fixed capital investment in long-lived assets, many of them underground.

The fixed costs of supply are typically very high relative to variable costs, more so than for other utilities such as electricity.[12] This cost structure means that most revenues in a self-financing water utility are returns to capital; it also implies that a water provider may be able to operate for many years without recovering fixed costs, and in such circumstances is likely to face political difficulties when prices need to be raised. Therefore, water providers have an economic incentive to extract monopoly rents, while at the same time being vulnerable to political pressures to keep prices low thus preventing adequate returns that would permit capital replacement and attract new investment.

Natural monopoly

Much, though not all, of the water supply system involves engineering scale economies which contribute to conditions of natural monopoly. These technical scale economies pertain especially to the water capture and transportation components (for example, based on storage and pipe capacity characteristics). But these economies do not necessarily dictate that an organizational monopoly is the most efficient structure throughout the system, even at the supply end. In a multi-reservoir system, for example, each reservoir could function analogously to an electric generation facility in a large electrical grid, creating the possibility of a decentralized wholesale water market in which competing reservoirs bid to furnish water to either bulk water transportation networks or directly to user groups (Noll, Shirley and Cowan, 2000). Unlike electricity, however, water is not a homogeneous product, so each supplier into the distribution network would have to undergo quality monitoring. Because water has a low unit value relative to its transport costs, centralized transmission through a large national or regional network as in the case of electricity grid is impractical, and so water systems tend to be highly decentralized geographically and often operate under local (at municipal level) or provincial jurisdiction (Foster, 1996).

[11] Wastewater capture and treatment may be considered a fourth component of supply, or a system of its own.
[12] For example, fixed costs account for over 80 percent of total water supply costs in the U.K. (Armstrong, Cowan and Vickers, 1994).

Although there is increasing experimentation with third party access, especially to service low income neighborhoods as discussed later, it remains generally the case that the capture, transport/distribution and treatment of water from each natural source is a natural monopoly.[13] A single vertically-integrated utility is the usual industry structure[14], especially in small-medium sized markets. For metropolitan areas with a larger market and reliance on multiple water sources, coexistence of several vertically integrated entities with each operating a separate local distribution network in separate zones of the city is more feasible, seen for example in metro Manila which is served by two contiguous water systems.

The network features of water systems imply, as in other infrastructure sectors, a requirement for system coordination--especially for control of the quantity and quality of water intake. The large component of capital stock underground also means that information on system conditions and operations is not readily evident to observation or comparison, creating a challenge for regulation.

Externalities

Water provision and use involve extensive externalities, both in terms of public health and environmental impact. Excessive water off-take from private wells leads to costly building subsidence. Poor disposal of untreated wastewater contaminates groundwater supplies and degrades natural resources in the wider region, such as watersheds and coastal habitats. Water spillage and pooling from poor drainage contributes to disease risks.

Many of these negative effects can be diffuse and long term, making them more difficult to identify and prevent. Reform of water and sanitation systems has historically received political impetus when the health dangers from inadequate provision have spilled over individual neighborhoods (usually low income) to affect the middle class and business interests—as in the case of the cholera epidemic in Lima in 1991 and high typhoid incidence in Santiago in the late 1980s that added urgency to the reform processes (Shirley and Menard, 2002). Policies governing water use rights, command-and-control regulations, and tax or fee-based restriction ("polluter pays") may be appropriate to limit harmful externalities. However, specifying such rules and charges correctly, without under-or over-restricting behavior to achieve the socially desired outcomes, and enforcing

[13] Water treatment and transport (primary network distribution) are most likely to be the bottleneck elements of natural monopoly in urban water systems (Noll, Shirley and Cowan, 2000).

[14] Vertical integration can be justified as well as a means of internalizing the environmental externalities of sewage discharge, and of permitting cross-subsidy of sewerage costs by water payments, since sewerage services cannot be disconnected for nonpayment (Foster 1996).

them are a real challenge. Experience shows that command-and-control approaches are often less effective in curbing pollution than financial incentives,[15] or than institutional pressures such as monitoring and public exposure of polluters' performance by citizen groups or the media (World Bank 2001).

The case of sanitation

Much of what has been said here about the cost structure and natural monopoly characteristics of water supply also pertains to piped systems of sanitation, namely sewerage, as well as to stormwater drainage. There are economies of scale in sewerage and economies of scope in combining water and sewerage transportation and delivery (Armstrong, Cowan and Vickers 1994). However, cost recovery is more difficult for sanitation than for water alone, in part because piped sewerage is very costly[16] and because more of the benefits are external to the individual user. Few lower-middle income countries have been able to meet the necessary conditions—adequate piped water flow, consumer willingness to pay, and fiscal ability to sustain financial subsidies for revenue shortfalls) to provide access to sustainable sewerage to more than a small minority of the urban population.[17] Effective demand for piped sewerage is more articulated at higher income levels where users place a higher value on convenience, amenities and environmental impacts.

Satisfactory health benefits can be obtained from less sophisticated sanitation methods, such as ventilated pit latrines, shallow (condominial[18]) sewers, and septic tanks, that are not at all or only partially networked but do require correct construction and maintenance.[19] The benefits and costs of these less expensive technologies are still not fully internal to the household, and so provision and use of such systems often require organization at the neighborhood level and may justify some public subsidy of initial construction costs. Such regulation or public oversight as is needed is usually best provided through the community or NGO and/or the local government. (PPIAF/WSP,

[15] Pollution taxes on firms reduce the efficiency effects of water pricing, especially under price caps (Noll, Shirley and Cowan, 2000)

[16] In Durban, South Africa, for example, a conventional household water connection costs about US$180, and sewerage connection, US$800 (Presentation at the World Bank, December 10, 2002, by Neil McLeod, Executive Director, Durban Metro Water Services).

[17] UN-Habitat Global Urban Indicators database.

[18] Condominial sewers involve shallow, small bore pipes running through yards connecting house connections to a neighborhood receptor. The system requires the neighbors to maintain the backyard network, the "condominial", and therefore substitutes an institutional input (collective action) for capital (the physical assets).

[19] These service types are not technically suitable for very dense settlements or for some geological conditions because they can contaminate underground water. In Durban, the simplest improved sanitation scheme costs US$120, which is still much more than the simplest on-site water connection (US$28).

2001). The remainder of this chapter focuses on water supply and sanitation business that is integral to a water utility.

Technological change in water supply systems

A significant difference between the water sector and most other infrastructure is that technological change in the past couple of decades has been much less dramatic or rapid, and has had less impact on the underlying economics of supply. Unlike telecommunications there has been no revolution in the product and in underlying costs; unlike electricity generation, no new production methods; and unlike some segments of transport, no major innovations permitting fundamental improvements in operation and management, or affecting the availability of critical information. The most significant technological innovation in conventional water systems has been the widespread introduction of metering at the point of consumption, which permits the utility to set a tariff reflecting the marginal cost of water used and to bill for actual consumption.

For metering to be worthwhile, the efficiency gains from giving customers an incentive to conserve water use must be at least as great as the transactions costs of installation and meter-based billing. Therefore, metering is most attractive in situations of water scarcity. In addition, if the costs of externalities are important in the water system (e.g. where there are serious problems of drainage or wastewater pollution), metering can permit usage-based prices to serve as a means of internalizing these externalities. (Noll, Shirley and Cowan, 2000) Overall, for considerations of efficiency, conservation and externalities, in most DTEs metering of consumption is recommended. But metering can also bring political advantages, by making information about consumption and pricing more widely available. In Santiago metering is seen as giving consumers more control, by informing them of their actual consumption and making the billing more transparent (Clarke 2001). In Guinea, the extension of metering to all administrative connections after 1996 helped to reduce the amount of water billed to government and reduce its consumption, but also underscored the seriousness of official nonpayment (Menard and Clarke 2002).

In response to demands of low-income consumers for better access to water, lower cost "appropriate" technologies have become a more recognized component of the urban water system.[20] For the most part these innovations were not the result of organized R&D efforts by the formal

[20] Although in rural areas non-networked water provision has long been the norm, the low cost technologies becoming more formally recognized in urban areas may be linked to the network utility, e.g. as bulk distribution systems.

utilities or government agencies, but rather a recognition and legitimization of existing alternative arrangements for self-provisioning and small-scale private distribution. Lower cost pipe technologies, some based on small-bore PVC pipes laid above ground, have reduced the economies of scale of secondary distribution. When they purchase bulk water from the utility, these small scale providers benefit from the network economies of scale and the utility's water treatment (Tynan, 2000). Even if the chemical quality of the water remains the same as that from the main system, however, it is not an identical product to the consumer because of lower pressure. These alternative providers do meet a segment of user demands typically not served by the network and provide some measure of contestability to the utility within this niche market. In the El Alto area of La Paz, Bolivia, when consumers were required to connect to the utility (because of its exclusivity rights), the consumers resisted because they preferred to stay with their alternative arrangements. (Komives, 1999)

The rationale for regulation

The existence of natural monopoly and importance of fixed costs, externalities and social welfare concerns in the water sector create a strong rationale for government regulation both to protect the producer and the consumer. Water provision is not highly contestable and the consumer is not able to assess whether water is safe to drink. Regulation in the public interest aims to guard against extraction of monopoly rents and to ensure adequate water quality, while at the same time guaranteeing the investor a necessary return on long-lived assets. Government ownership of water systems is not a substitute for regulation, since public monopolies can also have incentives to overcharge consumers who have no alternative supply, and to run down the capital stock and under-invest. Ensuring that water supply can keep up with demand in a sustainable manner requires institutional arrangements that can introduce competition wherever possible and otherwise improve access to information to the regulator and to the consumer, and instill incentives for efficiency. The next two sections discuss how relevant options for market structure, and regulatory rules, may meet these objectives under various conditions. The final section describes some recent experiences with structural and regulatory reform.

Market Structure and Institutional Options

Although the scope for competition is more limited in the water sector than in other areas of infrastructure[21], providing opportunity for competition in various forms is still a good principle for the structure of the market and design of sectoral institutions. Local conditions will dominate in determining what structural options are relevant—most importantly, the size of the water market, the fixed costs of accessing the available water resources, and the minimum efficient size of the treatment facility required. The attractiveness of the system to the private sector and possible benefits to be gained from privatization will also depend on the details of the regulatory arrangements, which are discussed in the next section.

The range of options for competition in water provision

As noted earlier, the natural monopoly character of water supply is sufficiently strong that structural unbundling is not very widespread and so vertical integration of utilities is the dominant mode of organization even in industrial countries. Horizontal integration is also common, in the sense of a single utility being responsible for a whole urban market (multiple utility providers within a city being relatively rare). The options for *direct* competition are discussed below in three respects—as direct competition for specific services; as competition *within* the product market; and as competition *for* the market. The latter is the main area of involvement by the

Table 5.2 Institutional Options

Option	Ownership	Financing	Operations
Service Contract	Public	Public	Public then some Private
Management Contract	Public	Public	Private
Lease Contract	Public	Public	Private
Concession	Private during Contract	Private	Private
BOOT	Private then public	Private	Private
Reverse BOOT	Public then private	Public	Private
Joint ownership	Private and public	Private and public	Private and public
Outright Sale	Private	Private	Private

Source: World Bank, Klas Ringskog, 1999

[21] This is because a greater percentage of the costs in water systems are in the noncompetitive network than in potentially competitive areas. This fact reduces the relative efficiency gains to be gained from competition in this sector. While 40 percent of the production costs in electricity are in network components (transmission and distribution) and 60 percent in potentially competitive areas (generation), in water two-thirds of the costs are in the network and only one-third in areas amenable to competition. (London Economics 1988)

international private sector. *Indirect* competition knows as yardstick competition is discussed later as a mechanism of regulation. The key features of the main institutional options in play are summarized in Table 5.2.

Laying the groundwork for competition: decentralization and corporatization

One of the points of international consensus regarding water management is subsidiarity, that is, placing responsibility at the lowest possible level—closest to the sources of demand and of relevant information, so as to increase accountability and efficiency. (WMO, 1992) Decentralization of urban water management is seen in many countries by the separation of water business fom government administrative departments by the creation of autonomous, self-financing utility-type entities (WDR 94), as is the trend within the European Union (Hall, 1998) and in Mexico, Chile, Brazil and Morocco. A 1997 Water Industry Policy in China has allowed water utilities to be created (Saleth and Dinar 1999). Even while remaining publicly owned, such corporatized and commercialized structures present the minimum conditions for competition, either direct or indirect, by making the business nature of water supply more transparent.

Some urban water companies remain owned by the national government (such as SANAA in Honduras) or province (SABESP in Sao Paulo, Brazil). Transferal to local government ownership and control has been occurring in some countries in the context of overall political and fiscal decentralization, for example in Hungary (Lobina and Hall, 1999). Another traditional structure, especially in Sub-Saharan Africa and Central America, is a single water company having responsibility for several or all water services in the country, rural and urban. (Box 5.1) The intent is to cross-subsidize the small town systems (usually) with the revenues from the larger cities. However, in Africa this national organization of the sector has not been very effective in extending service across the country relative to a more decentralized structure. Service coverage, both in the capital city and in all urban areas, in countries with a single provider is on average lower than in countries where water provision is organized subnationally. Moreover, the ratio of coverage outside of the capital to coverage in the capital is not, on average, higher in those African countries where water supply is under a single national entity compared to countries where it is organized at the local level. These results suggest that regional cross-subsidies have not been very effective and that

Box 5.1 Small town and rural water systems

In Cote d'Ivoire and Senegal the organization of a single national operator is designed for interregional cross-subsidization, with the capital cities providing most of the revenues to cover the costs of serving secondary and smaller urban areas at a uniform national tariff. In Cote d'Ivoire this system has functioned relatively well for a time in incorporating towns into the service area of the national water company, SODECI. But as villages are outgrowing their community management systems and the national operator has been unable to expand to all small communities, the limitations of this system are becoming apparent. The countries are looking to decentralize and create more incentives for competitive private provision to expand and improve services in the smaller markets. In Senegal the failures of the national entity to expand services to the rural communities has stimulated a dynamic system of community water systems, headed by village water committees and in some cases funded by migrant remittances. Recognizing the limitations of serving the country through one national utility, reforms in Senegal are raising the legal standing of the village water committees and organizing a system for service delegation that could promote local small-scale private providers. Some of the small towns on the perimeter of the formal utility network have opted to continue controlling their water services locally, even preferring to pay higher tariffs if they see that the benefits could be retained locally to support other community activities.

Source: Tremolet, Browning and Howard, 2002; Tremolet, 2002

monopoly supply, at least at the national scale, has not promoted service expansion. (Clarke and Wallsten, 2002)

Competitive procurement by a State owned enterprise: "Contracting-out" specific services

The practice of "contracting out" the right to perform specific functions for a water utility can introduce a focused element of competition. (Box 5.2) When potential contractors bid for such work to standards specified by the utility, it can provide incentives for efficiency and bring the company new skills and practices. Competitive contracting-out is the least complex form of private sector participation because the utility retains overall responsibility for operations and for fixed assets. The practice can help "break the ice" for public-private sector collaboration and elicit valuable information about costs of basic operations (Idelovitch and Ringskog 1995) Prior to the company's partial divestiture, EMOS in Santiago successfully contracted-out not only billing and meter-reading but also planning

Box 5.2 Service Contracts in Mexico City

In Mexico City, service contracts were issued with four private companies in 1993-94 for meter installation and reading, and billing. The main objective was to improve the efficiency of water and sewerage operations by reducing waste and raising revenues collected. A further aim was to acquire for the government better information on the condition of the physical assets, as a prerequisite to issuing a full management concession in a later phase (which has been delayed indefinitely). The contracts corresponded to different zones of the city, but the contract specification and bids were not sufficiently comparable to permit benchmarking costs and performance among the zones.

Source: Haggerty, Brook and Zuluaga, 1999

studies, construction and rehabilitation works, general repair and maintenance, computer and payroll services, public relations and industrial relations services (Alfaro 1996). In Chennai, India, the Metropolitan Water Supply and Sewerage Board has achieved cost savings of 45-65 percent in its sewage pumping stations that are contracted-out privately (World Bank/PPIAF, 1999).

Service contracts typically have short duration (months or 1-2 years) and can be subject to frequent rebidding. However, without open bidding, service contracts do not entail any particular incentive for improved efficiency. Privatized or privately concessioned utilities frequently procure goods and services preferentially from their own subsidiaries.[22] This need not be a concern if the overall concession was awarded competitively and the contract is well designed to promote the right overall incentives, but overreliance on a private operator's subsidiaries can add to a climate of public distrust in the utility.

Competition *within* the market

Competition by utility companies operating in parallel *within* the same urban water market has been relatively rare. In Paris and Manila, two large metropolitan areas, the market has been divided into separate zones with different companies which do not compete with each other directly but whose performance can be compared by a regulator (yardstick competition). Competition for customers can also take place at the boundaries of such service areas. Most product competition within a market occurs between piped water and unpiped sources (vendors or well water), but this is normally financially unattractive because piped water can be provided much more cheaply. However, it may become worthwhile for customers to seek such alternatives if the utility water is of very poor quality or excessively overpriced. Bypass of the utility network may also be feasible for some large customers who might be able to provide their own local system.

Competition in the product market for water is permitted in the legal frameworks of the UK and Australia as third party access to network infrastructure. However, the expense of transporting water means that common carriage and cross-border competition are not very economical, and as of 1997/98 common carriage had not been implemented in the water sector in either country. (ADB, 2000; Cowan, 1997).

[22] When a subsidiary of Vivendi (Generale des Eaux) was awarded the operating concession in Szeged, Hungary in 1993, a works company majority-owned by GdE was established at the same time and acquired an annual contract for all the maintenance work and exclusive rights to all works contracts issued by the Szeged concession. Bayliss, Hall and Lobina, 2001

Any competition within the water market can only become significant where the utility is not given an exclusive right to service customers in a particular area. (Klein, 1996) Such exclusivity is often awarded both to permit the utility to cross-subsidize different customers within the market, and to make a concession contract or equity share more attractive to the private investor. Governments may also justify exclusivity arrangements as a means to discourage use of alternative unsafe water or negative externalities from private well-drilling. But exclusivity can work against the public interest where water coverage is very low and utility performance very poor—the case in most cities of low income countries.

In Paraguay, independent small scale operators (*aguateros)* using low cost, small-bore pipes to distribute bulk water within periurban neighborhoods not connected to the main network system have been operating for years (Solo, 1998). Alternative providers have also been at least tolerated in many African cities (Collignon and Vezina, 2000). Formal utilities typically have little experience in providing their standard connections to the unplanned, quasi-legal settlements of the poor that are often characterized by extreme density, difficult topography, and unclear land tenure. In cities where large shares and numbers of residents live in such circumstances, allowing and encouraging alternative operators, as well as the utilities, to extend services of various qualities through innovative means is vital to achieve water for the poor within a reasonable timeframe and cost (PPIAF/WSP, 2001).

Competition *for* the market

Although long-run investment concessions have been one of the major modes of private sector participation and "competition *for* the market" of network utilities in recent years, two less extensive forms of private involvement are also seen in the water sector—management contracts and leases. *Management contracts*, with a duration of about 5 years, are limited to operations and maintenance. They are fee-based and do not entail any financial risk to the contractor nor responsibility for investment. The potential for management contracts to improve operational efficiency depends greatly on how performance targets are defined, what incentives are specified for the operator, and how the contract is monitored

It is generally recognized that a management contractor has at best very limited leeway to effect change if the institutional and political environment is not supportive, so this model has not been widely replicated. Mexico City, for example, does not have an institutional structure conducive to

the success of a management contract, as responsibilities for water supply are fragmented across agencies and 16 municipal governments, there is no legal basis for cutting off nonpayers, and no single regulator. In addition, the way that the service contractors were handled, with numerous delays, reduced the government's credibility with the private sector and undercut support for the second phase of private involvement, issuance of a broader management contract (Haggerty, Brook and Zuluaga, 1999) In Johannesburg, at the same time the municipal water service was corporatized in the late 1990s it was bid out for a management contract, because public opposition precluded attempting a long term private concession. The contract includes several incentive provisions which are paid out only made after a reputable international firm gives an independent assessment of the utility's performance (PPIAF/WSP, 2001).

Lease contracts (sometimes called *affermage)* are longer than management contracts—usually 15-20 years—and cover the full range of management responsibilities (technical and commercial). Funding of investment in new capacity remains the responsibility of the public sector. The operator is subject to some commercial risk, in the event of a shortfall between the *affermage* fee paid to it by the contracting authority (which is based on the volume of water produced or sold) and actual revenues collected. A performance bonus may be added, related to efficiency. Among DTEs, water leasing has operated longest in Abidjan, Cote d'Ivoire (since 1957) and currently is practiced *inter alia* in Guinea, Mozambique,[23] Niger and Senegal in Sub-Saharan Africa, Antalya in Turkey and Gdansk in Poland.

In *concessions,* the contractor acquires a long term right (typically for 20-30 years) to the use of all utility assets, as well as responsibility to make and finance new investments, with specified performance targets. The assets are returned to the public authority at the end of the contract period, and the concessionaire is compensated for own investments not fully amoritzed. Among the DTEs, in recent years water (and in some cases sewerage) concessions have been awarded and are functioning for Bucharest, Buenos Aires, Lima, and Sofia, to name some of the largest urban water companies, and for the national water and electricity authority of Gabon (the first true concession in Sub-Saharan Africa). Given their long duration, concessions pose major issues to both ensure credibility on the government's part and to permit necessary adjustments in major contract parameters, as discussed in the next section.

[23] Mozambique features a slight difference from these other cases, in that the operator pays a lease fee to the contracting authority which is fixed in advance and based on the financing costs of the infrastructure; the balance of the tariff revenue collected is retained by the operator as payment (PPIAF/WSP, 2001).

New water supply and/or water treatment utilities have also been established under BOO or BOOT[24] concession contracts in Chengdu (China), Ho Chi Minh City (Vietnam), Pusan (South Korea), and West Bangkok (Haarmeyer and Coy, 2002). Often BOO/T contracts, which are typically greenfield facilities rather than investment in existing water distribution systems, have take-or-pay provisions that can subject the government to contingent liabilities.[25] Making new investments in bulk water supply without curbing wastage in the distribution system may worsen service and harmful environmental externalities. Although greenfield projects are often politically easier to negotiate than fundamental system reform and restructuring, they underscore the urgency of adjustment to retail tariffs and to demand management (ADB 2000).

Box 5.3 Private sector transactions in water and sanitation

Private participation in water supply and sewerage has remained much below that of other infrastructure sectors (representing only 5.3 percent of global private investment in infrastructure in DTEs during 1990-2001). Private flows for WSS averaged $US4.6 billion in 1999-2001, compared to a decade high of US$9.3 billion in 1997 (in 2001 dollars). Latin America has received the largest number of private water/sanitation projects, but East Asia the highest share of investment value, with other regions well behind. Concessions are by far the most common type of projects in the sector, representing over 80 percent of investments in the 1990s while divestiture and operations/maintenance contracts are the least common (only 12 percent of contract types over the decade). Over half of the private WSS projects, and three-quarters of the investment value, has been awarded in six countries, among which are Argentina and Brazil.

Source: World Bank Private Participation in Infrastructure (PPI) Project Database. (Izaguirre, 2002)

Privatization of ownership

Sale of equity shares in water companies to private parties, with or without attendant restructuring or regulatory changes, is also occurring though with less frequency than in electricity or telecommunications. In Chile in 1999 the government initiated equity sales in several water companies, including EMOS (renamed Aguas Andinas) in Santiago, which had one of the best performance records of any public water enterprise in developing countries. The sales were intended as a prelude to concessioning but political resistance halted the procedure.

[24] Build-Operate-Transfer and Build-Own-Operate-Transfer

[25] Many of the Asian BOO/T contracts have been of this type, although governments have heeded warnings about overly generous revenue guarantees based on earlier IPPs in power generation (ADB, 2000).

In brief, the water sector does not illustrate wide variation or innovation in market structure or institutional options, and private sector participation has been modest in scale. (Box 5.3) While competition is inherently limited, the opportunities are often not fully tapped—for example, major private concessions in the Czech Republic, Hungary and Poland, in Timisoara, Romania, and in Jakarta were awarded without any competitive tendering (Bayliss, Hall and Lobina 2001; Lobina, 2001). Few long-term concessions have been terminated by the public authority or been lost to the original holder upon rebidding and renewal. The major private participants in internationally-bid contracts are very few, dominated by the two largest French multinationals (Vivendi and Suez-Lyonnaise, which between them hold two-thirds of the global privatized water market), and several smaller European–owned companies (SAUR, Thames, Anglian and IWL) (Hall and Lobina 2002). However, these companies are collaborators as often as competitors, since they frequently partner as consortia to win contracts (Bayliss, Hall and Lobina, 2001). What is critical to the sector's performance, therefore, is the content of regulatory design and its enforcement.

The choice of regulatory rules

Regulation of the water sector needs to serve three major economic and social welfare objectives—the weighting of which will vary by local conditions of the water resources, economic development, and politics:

- Efficiency—production and delivery of water at least cost, maintenance of assets, and conservation of supply
- Equity—access to affordable and good quality service for all
- Environmental sustainability—minimizing pollution and damage to natural resources.

The main challenges facing the regulator are lack of information, and balancing the interests of the investor, the consumer, and the taxpayer. Asymmetry of information on costs is a bigger constraint in the water sector than other infrastructure activities because of the limits to competition as a discovery mechanism, and because much of the water infrastructure is underground and not readily observable. Similarly, the quality of water can only be partially assessed by the consumer (in terms of clarity, taste, smell) but requires regular expert testing. To satisfy the interests of the investor the regulator needs to provide a credible commitment that adequate returns on long-lived capital assets can be achieved—this implies curbing public sector performance risk. To protect the consumer, the regulator must ensure that the water will remain safe and affordable. And to the

citizen-taxpayer, this assurance must extend to needs today and to future generations without creating an undue fiscal or debt burden, or irretrievably damaging natural resources. This section focuses on the regulation of pricing with some discussion of other regulatory rules (quality and other performance targets, especially pertaining to service expansion) to establish incentives and behaviors consistent with these concerns.

Pricing policy

In most circumstances the optimal pricing structure for water is a two-part tariff, with the first part being a capacity charge and the second reflecting marginal cost. This second part, a volumetric usage charge, assumes increased importance when water is scarce. (Noll, Shirley and Cowan, 2000) Ideally the usage charge should vary to reflect periods of peak demand relative to supply.

The short-run marginal costs of using any unit of water include not only the variable operation and maintenance costs, but also a resource or opportunity cost (from withdrawal of water from alternative uses, such as agriculture) and a discharge cost (of wastewater to the environment, if not treated). Including this last element in the tariff would permit to internalize the negative externalities of water use. Payments for the opportunity cost and externalities of water use may be collected with the tariff but should be kept not by the utility but by the owner of the water resource, such as a water management authority. However, few water systems (especially in the DTEs) charge for all these elements of true marginal cost even when environmental impacts and cross-sectoral allocation are burning issues (PPIAF/WSP, 2001)[26]

Indeed, even the basic operation and maintenance costs are often inadequately covered by tariff revenues. As an extreme illustration, in Lima in 1989, operating costs amounted to about 150 percent of operating revenues. (Alcazar, Xu and Zuluaga, 2000) Because of the high ratio of fixed to variable costs as noted earlier, in a self-financing utility a large share of revenue is quasi-rents. Whether the utility is publicly owned or private and regulated, political pressures will be strong to expropriate these quasi-rents by imposing low prices. Even if expropriation does not occur through price levels, it may through government non-payment of its own water bills—as has been a major

[26] Pricing of water to reflect accurately the full social costs of exploitation for alternative uses and of externalities would require that the interests of alternative users and of those affected by externalities are well articulated. However, since some users are not able to participate effectively in a market for water, because of collective action problems, poorly defined property rights, or transactional and information costs, water pricing can at best take into account only some of the opportunity costs and externalities. (Noll, Shirley and Cowan, 2000)

problem for the water companies in Abidjan and Conakry, where chronic payment arrears by public customers undercuts the tariff schemes (Shirley and Menard, 2002).

The information handicap

Even with the best political will, a regulator will have difficulty committing to allow efficient prices in the water system, because it has less access to information than the operator. A simple cost-plus pricing regulation is common because it relies on what the operator reports, but it does not provide incentives for improving efficiency. In Guinea the regulator of the lease contact, SONEG, has weak authority to compel information reporting by the leaseholder, SEEG. As a result of this weakness and political interference by the government, external audits revealed that the cost-plus formulas used to adjust tariffs had been misapplied, resulting in excessive price increases granted to SEEG. (Menard and Clarke, 2002) To combat the problem of information asymmetry, two approaches are used to reveal cost information: auctioning and yardstick competition.

Auctioning is especially appealing in the water sector because it can be applied to the range of contracting arrangements outlined earlier. Successful auctioning requires careful design and a minimum number of bidders. In Buenos Aires, for example, the water and sewerage concession was auctioned in 1993 to the bidder offering the lowest price of water for a given set of performance parameters. The winning bidders offered to deliver water at a price about 27 percent below the prevailing price, and committed to make annual investments in the first five years well in excess of those under state ownership (Klein, 1996). However, in 2000 there was only one bidder (Suez Lyonnaise) for Cameroon's water supply concession. In Cote d'Ivoire the government renewed the lease contract with SODECI, the private lease holder, in 1988 without rebidding, but used the threat of an auction to successfully win a reduction of the real tariff by 20 percent—an outcome which suggests that SODECI had been enjoying considerable rents. (Kerf, 2000). There can be conflicts of objectives in the design and awarding of concessions because of competing interests. In Budapest in 1997 the water supply concession was granted not to the consortium that offered the lowest price for water, but the one that promised the local government the highest transfer payment even with a water price above other bids (Hall 1998).

Since lack of information is also a deterrent for potential private operators, making system information available to potential bidders is critical to a competitive tender and a major due

diligence responsibility prior to inviting any private participation. And even when the water price has been set through auctioning of a long-term contract, it may still need to be renegotiated in response to changed circumstances outside the operator's control. The investors need assurance that they will be covered in the event of adverse external circumstances and, at the same time, the regulator needs to keep pressure on the operator to sustain a high level of efficiency and to pass on to consumers or taxpayers a share of the gains from any external or unforeseen cost reductions.[27] This tension has turned some water concessions into a battle of wills even where economic and institutional conditions should ensure success. (Box 5.4)

Box 5.4 An abortive attempt at water concessioning in Atlanta, Georgia

In the United States, 94 percent of municipal water systems (some 5000 separate utilities) are publicly controlled and most face massive requirements of repair and rehabilitation. In an effort to achieve operating efficiencies and access to private capital, over a thousand of these systems have turned to private long term concessions (up from only 400 in 1997). Atlanta undertook the largest such concession in 1999, signing a 20-year contract with United Water, a subsidiary of Suez. The concessionaire was to undertake $800 million in repairs over five years. But by January 2003, both sides conceded failure and agreed to cancel the contract. What happened? In the three years under the concession, the residents and city officials complained that the service was poor and unresponsive, fraught with water main breaks and safety failures leading to occasional "boil only alerts". But United Water argued that the system's infrastructure was in a much worse state of disrepair than it had been led to believe before the concession was signed, and that it was losing $10 million annually under a $22 million a year contract that the city refused to renegotiate.

Source: Douglas Jehl, "As Cities Move to Privatize Water, Atlanta Steps Back," New York Times, February 10, 2003.

Re-bidding of a major franchise is too costly and disruptive to be a practical approach for price adjustment, so between auctions a more calculated method of periodic adjustment by the regulator is needed. The shortcomings of rate of return regulation are discussed elsewhere in this report, and for the water sector this approach is clearly too information-intensive. An alternative increasingly seen as more appropriate for this sector, first adopted in 1990 by OFWAT (the office of water regulation in England and Wales), is a price cap (RPI – X) method of adjustment, which can

[27] In the UK, periodic cost adjustments for unforeseen circumstances ("interim determinations") can include price clawbacks if external factors cause significant cost savings to the utility. In 1992-94 the regulator decreed lower price increases than allowed under the 1989 price indexation formula because construction costs had fallen due to a national recession (Klein, 1996).

provide incentives for productivity gains. During the first periodic (5-year) review of prices under the formula OFWAT determined (in the face of consumer dissatisfaction) that the approved prices had been overly generous and tightened the parameters in the formula. However, the transparency of the method reduces some of the risk that such a review could be abused by the regulator (ADB 2000).

Even under a price cap, information on efficiency and other parameters is still necessary for the regulator to monitor the utility's performance. *Yardstick competition* permits indirect or by-proxy comparison among actual or stylized providers. Finding relevant comparators is obviously not easy, as the required information may be specific to a firm or a water system. A further issue is that using partial indicators of productivity can lead to inconsistent ranking of performance across utilities; where possible, regulators should use estimates of the industry's overall efficiency frontier. (Estache and Rossi, 2001) OFWAT has relied on benchmarking most intensively for price regulation, and in Chile the regulator refers to long-run marginal cost calculations of a "model" company (Klein 1996).

Balancing interests and allocating risks

A general principle of risk allocation is that each party should bear the risks it is best able to mitigate. Contracts and regulatory rules should require the operator/investor to bear the commercial risk (of demand and payment) but be able to cut off delinquent customers; construction risks (for concessions); and risks that can be hedged, such as normal foreign exchange and interest rate risk. Households should be required to pay for services, but within a social contract where costs of connection and of minimum consumption are shared for those unable to pay. The government (taxpayers) should bear these social commitments. Individuals must also be responsible for their own behaviors related to water and sanitation use and disposal but again, where basic hygiene education and access to minimum services are not adequate, the public sector must be proactive to correct these failures. Risks associated with political change, protecting the quality of water resources, and protecting against major macroeconomic setbacks are best borne by the government (ADB, 2000). However, in practice the magnitude and cost implications of external shocks are not always immediately evident and may require some burden-sharing among the government, the utility and its customers.

Interests of investors: With a clear mechanism of price adjustment the risks to the investor can be contained, but only insofar as the public owner and regulator make credible commitments—so that the investor can be assured that short term political pressures will not undermine the best laid plans. Credibility can be established by rules separating regulation from the government's ownership role, protecting the independence of the regulator, and strengthening the legal security of investors, as discussed in earlier chapters of this report. Further commitment devices can include public sector performance bonds, dispute resolution mechanisms (such as international arbitration in major cases), and roles for consumer representation. The multilateral institutions have played a part in backing the government's commitments, as in Guinea where the World Bank provided partial financing of a revenue subsidy during a period of phased-in tariff increases.

Because international experience with concession design is still evolving and each situation is different, flexibility on the part of the regulator is an important part of its credibility. The side-by-side concessions instituted for West and East Manila in 1997 were generally considered to be well prepared and designed. (ADB, 2000) However, a particular feature that allocated the existing debt portfolio of the parent utility (MWSS) to the West Manila concession, while leaving the East with the obligation to seek new financing for its larger investment requirements, has had the unanticipated effect of saddling Manila West with massive foreign exchange losses stemming from the 1997 regional crisis (which struck shortly after the contracts were signed). The consortium for this concession has demanded a doubling of the prices agreed at initial bidding. [28] Resolution to this financial problem, which could not have been fully foreseen (and adds to the stresses caused by El Nino), may be critical to continuance of the West concession.

Interests of government/taxpayers: A contrary risk to expropriation, and greater from the taxpayer's (and consumer's) perspective, is the risk of regulatory capture.[29] Capture is evident in some of the long-term concessions where the public authority has been reluctant to challenge the incumbent. However, regulatory capture has not prevailed in the face of extreme political opposition to a concession's performance--in Tucuman (Argentina), the 30-year concession granted to a subsidiary of Generale des Eaux (now Vivendi) in 1995 was terminated in 1998, because consumers rebelled against the doubling of tariffs while the company failed to meet planned

[28] Public Services International, "Paying for Privatisation:; higher prices, lower employment," World Water Forum, The Hague, 17-22 March 2000.
[29] Most of the research literature on the politics of regulation focuses on risks of capture, not expropriation (Noll, Shirley and Cowan, 2000).

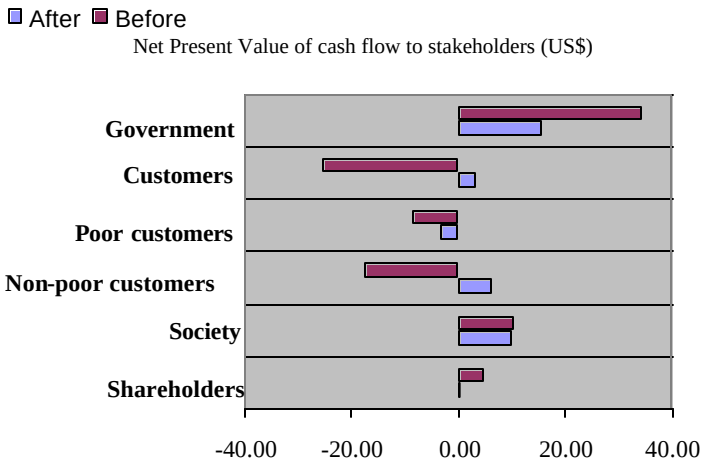
investment and water quality expectations. The water service in the province has since been returned to public operation (Hall and Lobina, 2002). In Cochabamba (Bolivia) and Szeged (Hungary), as well as in Tucuman, the multinational concessionaires have pursued legal claims for compensation after disputes, which, in some circumstances, could make it very costly and difficult for government to end such contracts (Bayliss, Hall and Lobina, 2001).

A regulator can also be captured by powerful interests other than the utility, such as certain user groups or suppliers. To guard against excessive influence of any well-organized party it is essential for regulation to proceed with open access to information on decisions, procedural transparency, opportunity for any stakeholder group to represent its concerns, and judicial reviews (Noll, Shirley and Cowan, 2000).

Interests of consumers: In addition to attending to the basic structure and level of the water tariff, the regulator is also concerned with its application to different classes of customers. Many water systems, as with electricity and some transport services, feature internal cross subsidies from industrial and commercial users to households. The general drawbacks of internal subsidy schemes are discussed elsewhere in this report; they are particularly problematic for the water sector in circumstances where large shares of the population are very poor or without service connections, so the burden on certain customer classes, such as large firms, is very high and could entice them to exit the network (as in Lima and Mexico City).

Price and regulatory policy towards households in developing countries needs to be designed to permit sustainable, affordable water consumption for all, with incentives for residents to avoid waste and for the utility to extend connections to unserved neighborhoods. To ensure this outcome it is important to examine regulatory rules explicitly in terms of how benefits and costs will fall to different consumers. In several of the proposed provincial concessions in Argentina, the initial regulatory terms featured a tariff structure favorable to existing users and weak provisions for funding new connections. But the strongest gains were anticipated to accrue to the government, through fees to be paid by concession operators. By subjecting the proposed contracts to stakeholder analysis it was possible to identify the extent to which the terms would benefit government disproportionately and disfavor consumers (Figure 5.1). After redesign of the concession, net losses to customer groups were converted to net gains—except for the poorest customers, for whom further tariff reform would be needed (van den Berg, 2000).

Figure 5.1 Winners and Losers Before and After Adjustments to Concessions--Parana, Argentina



Source: "Water concessions - Who wins, who loses, and what to do about it", Van Den Berg, Caroline 2000

Ensuring access and affordability for the low income population

The urgency of meeting the needs of poor households through urban water sector reform has been getting increasing international recognition (PPIAF/WSP 2001). In many cities of the developing world 40 to over 50 percent of the population lives below the locally-defined poverty line (WDI 2003). And while officially reported data on access to water often suggest that the vast majority of urban residents are already serviced, the averages mask major gaps and inadequacies. Residents living in quasi-legal or periurban settlements (representing millions of people in many large cities) are often not counted as part of urban jurisdictions, so not recognized as a customer base by official urban agencies. And the effective access and quality of water even for those with nominal connection is often very poor—for example, coverage data in Conakry include people using standpipes, which in Africa serve an average of fifteen people. At the time Lima initiated reform of its state owned water company in the early 1990s, 48 percent of the connected population received water service for less than twelve hours a day, and 28 percent for less than six hours (Shirley and Menard, 2002)

Box 5.5 Creative management of the free water commitment in Durban

In South Africa recent national law has instituted free water for a minimum consumption of 200 liters per household per day. Durban Metro Water therefore does not bill households for the first 6 cubic meters consumed per month.[1] Instead of allowing this subsidy to create a financial burden to other consumers or rationing water through poor service or nonconnection, the utility has decided to apply innovative low cost schemes to meet the needs of its low income customers. In partnerships with two private sector firms (Lyonnaise des Eaux and Vivendi), who are responsible for designing and managing pilot projects to test such schemes, the utility is developing a range of service levels that are geared to customers' actual effective demand and are upgradeable. For water, the options include semi-pressure systems with water tanks on household roofs, which permits the mains to be smaller than usual, and delivery to the household is metered. Low cost sanitation, complementary to the semi-pressure water system, includes options of improved latrines and condominial sewers that are maintained by the community. The arrangements restrict water flow to minimize waste and theft, include provisions for credit for connection, and incorporate user education and community mobilization. Sanctions for nonpayment are enforced.

Source: Brocklehurst, 2001

Policies aiming to promote access and affordability for low income consumers have included guarantee of free minimum service, increasing block tariffs (IBTs), direct (nontariff) subsidies to users, and mandates (community service obligations), performance incentives and fiscal transfers to utilities to encourage new connections. (Clarke and Wallsten, 2002; Chisari, Estache and Laffont, 1999) One city in South Africa has used the national free water policy as an incentive for innovation (Box 5.5) In Cote d'Ivoire and Senegal a social tariff covers consumption up to 18 and 20 cubic meters, respectively, and the government absorbs the connection costs for households eligible for this tariff (Tremolet, 2002). Higher consumption levels pay progressively higher tariffs.

Such *increasing block tariffs* (IBTs) are quite widely used in developing countries because they are perceived to be fair and to discourage excessive consumption, although the actual effects can be rather perverse. (Boland and Whittington, 2000) In countries where many poor households share connections, IBTs can shift these users into the higher rate categories. The system also can create a disincentive for the private operator to extend service to low volume consumers (PPIAF/WSP 2001), and can only be maintained under exclusivity. A uniform volumetric charge for water is therefore more equitable in practice, although may be less politically popular.

In most countries, subsidies through a "social tariff" are ineffective at reaching the poor, regressive, and (when inadequately funded by government), contribute to utility deficits and to rationing. In Belem (Brazil) in the mid-1990s, the poorest quintile received none of the total subsidy expenditure, the second quintile received only 12 percent, and the richest quintile absorbed almost 40 percent (Alfaro, Blanlot, Bradburd and Briscoe 1997; WDR 1994). Chile is one of the very few developing countries that operates a *direct subsidy for water consumption* that is means tested, and administered by the municipal government. The subsidy expenditure (funded by national government) for eligible households is then transferred to the utility and netted out of the water bills for these customers, who must remain in good standing. This model remains one of the best examples of subsidy design but has not been widely replicated elsewhere, possibly because it requires a strong administrative capacity. (Foster, Gomez-Lobo and Halpern, 2000)

Box 5.6: Making new connections affordable in Buenos Aires

The concession contract in Buenos Aires featured targets for new connections, with priority to be given to investment in poor areas. To finance the extensions an infrastructure fee was introduced, payable by the new customers over two years. For lower income households this fee was unaffordable; moreover, the new customers objected to the investment charge as unfair, since for others who had gotten connections before the concession these costs had been spread over the entire customer base. Although the access fees were adjusted several times, affordability and resentment created a crisis leading to renegotiation of the contract in 1997. At that time the infrastructure charge was replaced by a bimonthly "Universal Service and Environmental Improvement Fee" which is levied on all customers regardless of when they connected to the network. Connection charges were reduced and made repayable in interest-free installments spread over five years.

Even though these changes led to a 74 percent decrease in average bills for households in poor neighborhoods, problems of affordability persist. There are also concerns that the renegotiation reduced some of the targets for expansion, which will mainly affect low income neighborhoods.

Source: PPIAF/WSP 2001; Alcazar, Abdala and Shirley 2000

If subsidies are required to ensure affordable water service for the poor they should ideally focus on access rather than consumption, in order to avoid distorting incentives for efficient use.

Connection costs have typically been found to pose a greater barrier to affordability than even normal tariff rates (Tynan, 2000). In recent years lease and concession contracts have encouraged new connections with various approaches and mixed success. What is evident is that incentives for both consumers (affordability) and for the investors (profitability) need to be right, and the contracts should encourage flexible and innovative approaches to meeting targets. In Buenos Aires, after a rocky start a more satisfactory method of financing new connections has been found, but the pace of new expansions may be less than originally planned. (Box 5.6) In the contracts for two parallel concessions operating in East and West Manila, the concessionaire is permitted and even encouraged under certain circumstances to relax its exclusivity by delegating a service license to a third party, such as a bulk provider. Retail sales by these licensees are counted as contributing to the concessionaires' coverage targets (PPIAF/WSP 2001).

Implications of quality and other performance regulations for serving low income households: Regulation in the water sector typically includes specific standards that utilities must meet, not only of water safety but also of service levels, water pressure, equipment, specific technologies and procedures (e.g. for billing). Though well intentioned, such standards are often make it virtually impossible for the utility to incorporate lower cost approaches as discussed above, or to provide a menu of services in line with poor households' willingness to pay—as illustrated by the experience in El Alto/La Paz, Bolivia (Box 5.7).

Box 5.7 Adapting quality standards to permit extension of low cost service: El Alto (Bolivia)

In La Paz (Bolivia) the Suez-led water concession awarded in 1997 to Aguas del Illimani contained explicit targets for connection of poor households but did not provide adequate financial incentives for the company and the government did not make provisions to ease affordability with targeted transfers.The concession contract specified that metered in-house water and sewer connections were the only acceptable standard, which put service out of reach of low income households and virtually guaranteed failure for the company in meeting its ambitious target of total water coverage in four years. However, the regulator and the company agreed to experiment with a less expensive, condominial technology for water and sewerage, which was found to be affordable and acceptable to the population, and has permitted affordable service to be extended in the poor neighborhood of El Alto. By 2001 the condominial technology was legitimized by the Bolivian Institute for Technical Norms and Standards

Source: Hall and Lobina, 2002; PPIAF/WSP, 2001; Komives 1999

Especially where large shares of the population do not have connection, regulators need to take a flexible approach even to output standards, to encourage innovation. As a general rule, quality and performance regulations should be *output-based* rather than input-based, to provide the maximum incentive for the utility to seek creative and efficient approaches to meeting targets (PPIAF/WSP, 2001). To protect public health, minimum health standards of water quality and pressure should not be compromised but these are often below the levels actually imposed by regulation.[30] Legal restrictions on the utility, such as exclusivity provisions as noted earlier or proscription against connections to households with formal land title, can be formidable barriers. (Box 5.8 – Cote d'Ivoire) Rigid business practices such as monthly billing can also exclude customers with very low purchasing power (Baker and Tremolet, 2000).

Box 5.8 Providing financial incentives for extending "social connections" under the water lease in Cote d'Ivoire

The least contract between the government of Cote d'Ivoire and the private lease holder, SODECI, contains several provisions to promote extension of services to low income households. Since the company's remuneration comes from tariff revenues it has an incentive to serve new customers and additional funds are available to the operator to install subsidized "social connections". In addition to a "social tariff", the "social connection" is fully subsidized for households that meet eligibility criteria set by the government. The social connections are financed by a charge, separate from the water tariff, which the operator is obliged to collect from all water customers. The proceeds are deposited in a separate account dedicated to social connections, and the operator retains the same profit as with regular connections.

Over 300,000 new connections, 90 percent of them social connections, have been made since renewal of the lease contract in 1988. While the operator has no financial disincentive to serve new customers, a major drawback of the lease contract is that SODECI is only permitted to install connections in legal settlements, while an estimated 70 percent of the unserved population is non-Ivoirien and living in illegal settlements

Source: PPIAF/WSP, 2001

Organizing water regulation and ensuring enforcement capacity

As with the other infrastructure sectors, regulation of water can be undertaken through a national agency, such as OFWAT, or at the local/regional level.[31] Since water is provided as a local service that is usually (especially after political decentralization) the responsibility of local governments, it is important that these authorities be well represented in the regulatory agency. Few municipal governments have the capacity to design competitive contracting themselves or to carry out regulation, and obtaining expert advice can be essential to ensure a balanced negotiation with more knowledgeable private partners. Municipalities have agreed to guarantee concession holders against

[30] Minimum standards should be for pressure of at least 1.5 bar to avoid contamination, availability of 20 lpcd, 24-hour continuity of flow, and WHO standards of water safety (PPIAF/WSP, 2001)

[31] Issues related to management of water resources, however, often need to be addressed at a higher jurisdictional level, which may be cross-regional and even cross-border.

revenue losses in the Czech Republic and Hungary, which creates a major risk for taxpayers that they may not fully appreciate at the time (Hall, 1997). Municipal involvement in the regulatory board of Buenos Aires, and control by several municipalities in the case of Mexico City, did not contribute to regulatory autonomy nor avoid problems of politicization (Shirley and Menard, 2002). Since municipalities are often water providers, conflicts of interest need to be avoided. In the case of the lease for Gdansk, for example, the City is both a regulator and a contractual party, owning 49 percent of the consortium that holds the contact.[32]

Unclear relations between levels of government can be a problem for water regulation. In the case of the water concession for the city of Cordoba, Argentina, lack of clear division of responsibilities between the provincial government, which owned the infrastructure, and the municipality, which retained responsibility for making residential connections (while the operator's responsibility was only to build and extend the primary network), undermined the overall regulatory role of the public sector (Nickson, 2001). Such circumstances can strengthen the bargaining power of the private operator. Sometimes the regulator has been bypassed entirely in critical decision-making, as in Buenos Aires where government (the Ministry of the Economy and Department of Natural Resources) renegotiated the concession in 1997 without any intervention by the regulator (ETOSS). The outcome was appealed by some consumers' associations and by the national ombudsman, in part because the process had undercut the credibility of the regulatory agency (Conte Grand, 1998).

Consumer involvement in water regulation can be an invaluable means of providing information to the regulator (especially on the needs of poor consumers) and creating oversight of both regulatory and operator behavior. Consumer representation in regulatory reviews is more common in industrial countries than in most of even the reformed water systems of DTEs noted here. Indeed, a lack of public disclosure of key information and contractual provisions is rather common and advocated by the multinationals to protect commercial secrets. For example, documents concerning the Budapest Sewerage Company, in which a consortium of Vivendi and a German company holds an equity share, are not made available even to the city council and matters concerning the company are debated in closed council sessions.[33] Transparency and a two-way flow of information with the

[32] Klaus Ringskog, presentation on "Private Sector Participation in Water Supply and Wastewater: Case Studies", The World Bank, 1998.
[33] Public Services International, "Undermining Democracy and the Environment", PSI Briefing—World Water Forum, The Hague, 17-22 March 2000.

public on system performance, coupled with sound basic institutions undergirding regulation (rule of law, checks and balances, protection of property rights and contracts), may be the best system to ensure that regulation balances the interests of multiple stakeholders in the fairest manner.

The Outcome of Water Reforms

Major structural and regulatory reforms, and private sector participation, are more recent and less ubiquitous in the water sector than in other infrastructure sectors, so it is even more difficult to obtain a clear and robust picture of outcomes. Of the large private sector partnerships, most are only about five years old, with the exception of leasing in Abidjan and the water concession in Macau, China, which was launched in 1982 as the first of its type in Asia but built on decades of previous experience with private sector provision. Attributing results to reforms is also complicated because the changes in institutional arrangements, especially those that convert public operation into formal contracts with private providers, make explicit what may have been prevailing but hidden under the public system—such as nonpayment of water bills by government agencies, other implicit taxes and subsidies, and the backlog in system maintenance. Any assessment of the performance of reforms or institutional arrangements should ideally take full account of the prevailing sectoral and economic conditions, and the details of regulation as actually applied. Such thorough analysis is not available for many cases over time, and especially not in a form that permits comparison among different regulatory or contractual regimes. This section summarizes findings from such comparative analyses (cross-country/city and cross-institutional type) as have been done to date. Definitive conclusions about success or failure are not possible at this time, but many of the factors contributing to the likelihood of more positive or negative outcomes are becoming better understood.

Comparison across water systems

Shirley and Menard (2002) have compared the content and outcomes (through 1996) of six cases of water system reform initiated between 1988-93: the concession in Buenos Aires (BA), service contracts in Mexico City, state ownership and operation in Santiago (including contracting-out) and in Lima (where a concession was planned but not implemented), and lease contracts in Abidjan[34]

[34] Although Abidjan has had a lease contract with a private company continuously since 1957, when the lease expired in 1986 the government used the threat of an auction to win a price reduction. The renewed contract gave the operator more control over the management of investment.

Table 5.3: Conditions and Reforms in the Sample Water Systems

	Buenos Aires	Mexico City	Lima	Santiago	Abidjan	Conakry
Year of start of reform	1993	1993	1992	1989	1988	1989
Type of reform						
Planned	Concession	Management	Concession	Sale	Lease[b]	Lease
Implemented	Concession	Service contract	SOE	SOE	Lease	Lease
Population in service area (millions) at time of reform	8.70	8.40	6.40	4.60	2.00	1.00
GDP per capita at time of reform (US$)[1]	8,861	7,647	3,462	7,101	1,582	1,398
Population connected (%) at time of reforms						
Water[2]	0.70	97%[3]	0.75	0.99	0.60	38%[7]
Sewerage	0.58	86%[3]	0.70	0.88	0.35	0.10
Population growth rate (%) Annual ave. 1980-1995	1.5%[4]	0.03	2.35	0.02	0.05	0.06
Water production (millions of M^3 per year) at time of reform	1402.00	1113.00	527.00	478.00	67.00	163.00

Source: "Cities awash: reforming urban water systems in developing countries", M. Shirley and C. Menard, 1999

[1]National. [2]Includes private taps in yards of dwelling. These were predominant in Abidjan and Conakry, and important in Mexico (20% of connections) and probably in Lima; they were minimal in Santiago and Buenos Aires. [3]1990. [4]1980-1991 [5]1993-1996. [6] Before reform the lease in Abidjan had some characteristics similar to a management contract. [7]Includes people with access to standpipes or neighbors' taps

and Conakry. Table 5.3 summarizes the initial conditions in the six cities. Rates of connection were lowest for the two African cities, which not surprisingly were the poorest and most rapidly growing of the sample. Water stress (unsustainability of the water resources) was most severe in Lima and Mexico City, however.

The regulatory frameworks

Table 5.4 outlines key features of the regulatory regimes. Competition featured only in Buenos Aires, Abidjan and Conakry, through competitive bidding. As the only case of concessioning, the regulatory framework in BA imposed a fuller range of financial risks on the operator/investor than the other systems. However, the two lease contracts also provided for some form of efficiency pricing as well as full metering, with tariffs covering marginal costs as in BA. All but Santiago used internal cross-subsidization of low volume by high volume customers. None of the cases except Santiago both set coverage expansion targets for the operator, and made it affordable or the poor to connect (although this was improved after the renegotiation in BA). The institutional structure of each regime (commitment devices, regulatory neutrality, enforcement mechanisms, consumer representation) was not very strong or formalized in most cases, but was clearly the best in Santiago—which, perhaps ironically, represented the case of state ownership and operation.

Results

Changes in economic welfare after the reforms, combining the effects to government, consumers, workers and domestic investors, can be estimated and compared to a counterfactual (non-reform) scenario. For the cases where data permit, the per capita welfare gains are estimated to be largest in Buenos Aires (US$150 in 1996 prices), US$64 in Santiago and US$12 in Guinea; for Lima, assuming the concession had been implemented as designed, the welfare gains were estimated as US$85 versus US$8 in the actual (minimum-reform) case.[35]

[35] Method of calculation is explained in Shirley and Menard (2002).

Table 5.4 Comparison of Characteristics of the Regulatory Contracts

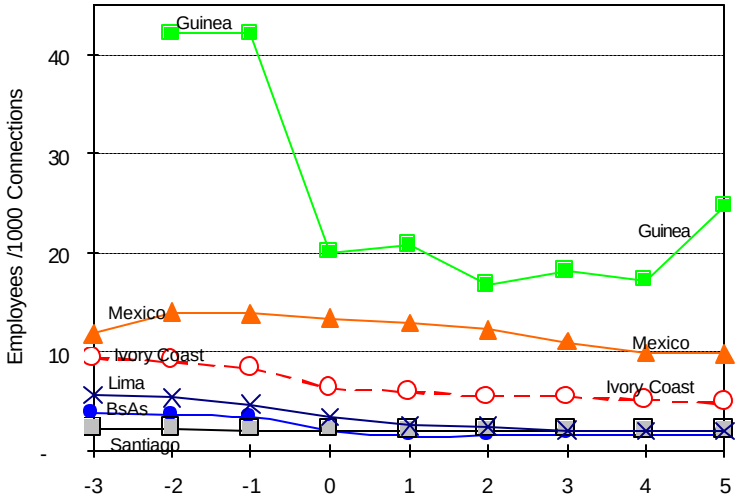
	Buenos Aires	Lima	Mexico City	Santiago	Abidjan	Conakry
Information:						
Competition for market?	Concession bid competitively	No	No	No	Contestable lease	Lease bid competitively
Yardstick competition?	No	No	No	Some	No	No
Separate monitor?	Yes	Yes.	Only of service contracts	Yes	No	No
Incentives:						
a. Operator						
Coverage targets?	Yes	No	No	Yes	No	No
Waste targets?	Yes	No	Stage III	Yes	Yes	Yes
Pollution targets?	Yes	No	No	Yes	No	No
Bears investment risk?	Yes	No	No	Yes	No	No
Responsible for sewerage operation?	Yes	Yes	Yes	Yes	No	No
Price cap or other efficiency tariffs?	Yes, but disputed index	No	No	Benchmark	Cost plus; periodic	Cost plus; periodic
Tariffs cover MC?	Yes	No	No	Yes	Yes	Yes
No or low cross subsidies?	No	No	No	Yes	No	No
b. Consumer						
Affordable for poor to connect to water?	No[1]	No	Yes	Yes	Yes	Yes, usage not affordable
To sewerage?	No[1]	No	Yes	Yes	No	No
Metered prices?	Few	Few	Increasing	100%	~100%	~100%
Pollution tax or other measures?	Treatment targets	No	Prohib. irrigation of foodcrops	Prohib. irrigation foodcrops	No	No
Commitment:						
Performance bonds	Yes	No	No	No	No	No
Dispute resolution	Yes	No	No	Yes	No[2]	No[2]
Consumer representation	No	No	No	No	No	No
Institutions:						
Expropriation safeguards?	Reputation, checks & balances	Reputation, no checks & balances	No	Law, checks & balances	Donors	Donors
Cutoffs allowed?	Yes	Yes	No	Yes	Yes, except Govt.	Yes, but no penalty for theft
Independent, neutral regulator?	Yes, but political board	No	No	Yes	No	No
Neutral enforcement?	Courts, but not independent	No	No	Courts, arbitration	No	No

[1]Became affordable after the 1997 renegotiation. [2]Does not include international arbitration

Source: "Cities awash: reforming urban water systems in developing countries", M. Shirley and Cl. Menard, 1999

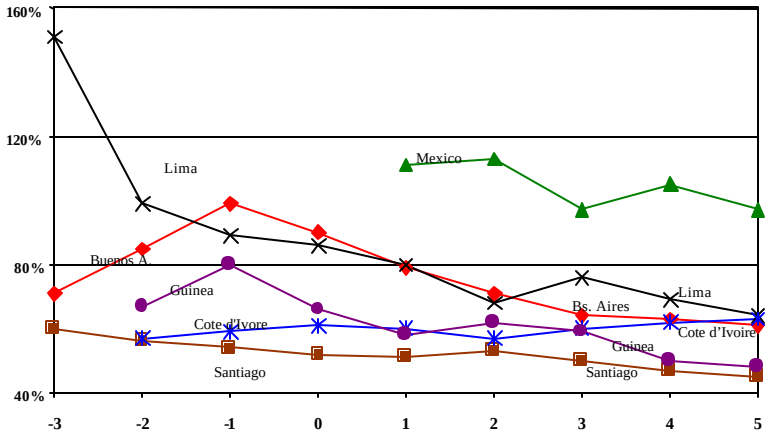
The initial results after a few years of reform can be observed by comparing before and after indicators of efficiency and other performance measures. Figures 5.2 and 5.3 show the trends in labor productivity and in operating costs in pre-and post-reform periods. Employees per connection fell in each city after the reforms, and costs fell below revenues in all cases except Mexico City. Table 5.4 summarizes the growth in coverage and new connections, and reduction in unaccounted for water after the reforms. All the cities except Lima showed improvement in the coverage indicators, in some cases (Abidjan and Conakry) quite dramatically. Unaccounted for water, a measure combining physical losses (due to poor maintenance) and commercial losses (poor financial management or illegal use), fell significantly in BA, Lima and Santiago but the improvement was less evident in the other three cities.

Figure 5.2 Labor Productivity
(Employees per thousand connections; year 0=year of reform)



Source: "Cities awash: reforming urban water systems in developing countries", M. Shirley and Cl. Menard, 1999

Figure 5.3. Operating Costs as % of Operating Revenues (year 0 = year of reform)



Source: "Cities awash: reforming urban water systems in developing countries", M. Sh Menard, 1999

Quantitative Studies

Few studies have tried to subject performance data from different water systems to econometric analysis in order to determine factors driving better or worse outcomes. One such study by Estache and Kouassi (2002) derives a combined productivity indicator for 21 African water utilities and determines how each compares to an estimated "production frontier" for the group. The analysis confirms a wide heterogeneity in performance and large scope for improvements, as also evident from case studies. The authors conclude that the institutional capacity of the country, as well as quality of governance, are key factors determining efficiency and more important than private participation in itself.[36]

Table 5.4 Effects of the Reforms on Access and Waste

	Buenos Aires	Mexico City	Lima W/out Concess.	Lima With Concess.[3]	Santiago	Abidjan	Conakry
Water Coverage[2]							
Pre reform[1]	70%	95%[5]	75%	75%	99%	72%[6]	38%[7]
1996	81%	97%[4]	75%	85%	100%	82%[6]	47%
Sewerage Coverage							
Pre reform[1]	58%	86%[5]	70%	70%	88%	35%[6]	*
1996	62%	91%[4]	70%	83%	97%	*	9%[4]
Growth in new connections (annual averages %)							
Pre reform[1]	2.10%	n.a.	4.00%		2.90%	4.00%	-0.10%
Post reform	2.80%	5.10%	4.00%		3.80%	6.70%	8.50%
Unaccounted for water[8]							
Pre reform	44%	37-47%	42%	42%	34%	13%	35-60%
1996	34%	37%	36%	30%	20%	16%	50%

Source: "Cities awash: reforming urban water systems in developing countries", M. Shirley and Cl. Menard, 1999

[1] Pre reform dates are: Buenos Aires 1992; Lima 1991; Mexico City 1992; Santiago 1988; Abidjan 1987; Conakry 1988. [2]Does not include public standpipes. [3]Estimated on the basis of draft concession agreement.

[4]1995. [5]1990. [6]for all urban areas under private operation. [7]1989. [8]Unaccounted for water (UFW) is the difference between volume of water distributed to the delivery system and water sold, and includes physical losses from pipe breaks and overflows as well as commercial losses from illegal use, under registration of users, etc.).

*The sewerage estimates in Abidjan and Conakry are not believed to have changed much.

In another study of alternative efficiency measures for 50 Asian water utilities, Estache and Rossi (2001) find statistically significant evidence that private operation is correlated with greater efficiency, using several different indicators.

Clarke and Wallsten (2002) compare the performance of water systems in Africa in terms of their piped water coverage of urban households headed by individuals with different levels of education (taken as a measure of overall household welfare). This analysis finds that in the countries with public operators, coverage of households whose head has no education is lower (25.4 percent) than

[36] The sample of 21 utilities includes only two that involve the private sector (through leases). According to the analysis of efficiency these did not rate as the highest performing companies during the period under study.

in countries with established private operators (30.6 percent). Conclusions are similar when comparing the share of connected households with uneducated heads as a percentage of the share of connected households whose heads have secondary education (thus controlling for the country's level of development).[37] This study also concluded from cross-country analysis that there was no evidence that reforms of water and other infrastructure sectors harm low income consumers, and the poor seem to benefit at least in terms of increasing their chances of become connected to the network services.

Conclusions

The political economy of water has not been highly favorable to reform in many countries, which partly explains why the water sector is behind electricity, telecoms or transport in restructuring or privatization. Major water reforms have tended to be provoked by public health crises, as in the case of major epidemics as mentioned, and to some extent by fiscal or macroeconomic pressures such as rising inflation that reduces real water revenues. Inflation, mounting budget deficits and government debt were factors leading up to the reforms initiated in Buenos Aires, Lima, Conakry, Santiago and Mexico City in the late 1980s-early 1990s (Shirley and Menard, 2002).

The circumstances that mattered most to the course of reform in these cities studied was the relative power of potential winners and losers. Water reform typically has high social benefits but low political benefits, especially in comparison to other utilities (Menard and Shirley, 2001). The political benefits may come from expanded service to the unconnected population, typically the urban poor, and improved quality of service to middle income groups. But these political gains may be smaller than the risks from necessary price increases and from cutbacks in patronage employment in publicly owned utilities. Water sector reforms have been politically most difficult to sustain in cities where the marginal supply price of water is steeply increasing and wastewater creates large externalities—such as Lima and Mexico City, as discussed earlier. In Buenos Aires, by contrast, the lower cost, renewable water resource made it possible to reduce water prices and still generate enough return to attract private investment (Noll, Shirley and Cowan, 2000).

[37] Only two countries (Cote d'Ivoire and Guinea) are counted in the sample as having established private operators. The two other countries with more recent private participation (Senegal and CAR) also show higher rates of connection of noneducated household heads than the average for public systems.

Although it is too early to draw firm conclusions about what kinds of water sector reforms and institutional arrangements are most effective in different circumstances, the following observations can be made:

Identifying winners and losers in advance, and adjusting the balance where possible, may help the sustainability of reform. A perception of fairness and evenhandedness is important—as evidenced by the protests in Buenos Aires, when newly connected households were charged installation fees that existing customers had not had to incur.

Price increases can be acceptable when customers see that quality and service are improving as well, when they are well informed, and when they can control their own consumption. Where supply capacity is constrained price increases can help expand service and so benefit the poor.

However, expansion of coverage to low-income households cannot be taken for granted but, where this is a policy objective, must be a deliberate focus of regulatory and contract design. Where necessary, subsidies should be assigned to support connection not consumption, and regulatory rules should favor innovation and competition by providers.

Lack of information is a major constraint to the private sector (especially potential entrants), to the public sector as regulator, and to the consumer. Improving access to information may lesson distrust and defuse some of the sector's political volatility.

CHAPTER SIX

An Agenda for Action

Since the 1980s, a large number of developing and transition economies (DTEs) have implemented far-reaching structural reform, market liberalization, and privatization programs in their infrastructure sectors. While the experience varies considerably across countries and industries, by and large, these first generation reforms have brought about several of the expected benefits of market liberalization and private enterprise: enhanced productivity and cost-effectiveness, improved output quality, greater responsiveness to consumer and business needs, and increased investment driven by market incentives rather than bureaucratic preference. Still, the critics of the reform process are right in pointing out the many instances where privatization was undertaken in the absence of institutional safeguards and conducted in ways that were widely viewed as illegitimate. In those circumstances, the transfer of state assets to private control may indeed have been a dubious achievement (Stiglitz 1999). Concerns are increasingly being expressed about the distributional consequences of privatization and market liberalization--especially their impacts on basic service provision to poor households and other disadvantaged groups (Chisari et al 2001).

Whether, especially in emerging market economies, the privatization of infrastructure supply was desirable even in the absence of effective regulatory and other institutional safeguards is ultimately an empirical question. However, the proposed agenda for action is not intended to provide an answer to that question. It is still too early for an unequivocal verdict—indeed, if there can ever be one, given the multi-faceted character of these industries' performance, the difficulty of constructing theoretically defensible counterfactuals, and the lack of tight analytic models which would permit precise hypothesis testing. Instead, the proposed agenda focuses on the second-generation regulatory reforms that will need to be implemented if even carefully crafted privatization and restructuring programs are to satisfy their public interest goals and expectations (Jacobs 1999).

This report presented many cases, in many DTEs, where the network utilities were privatized, restructured, and placed under regulation in ways that were influenced by the state-of-the-art in policy, and that reflect genuine creativity applied for the public interest. In short, there is much to

applaud in these sectors, from their new architectures to the skills and commitment of those who crafted them, who operate in them, and who regulate them. However, even in those countries where there has been an excellent process of restructuring, unintended consequences of the reforms have arisen and caused significant problems. The emerging second-generation regulatory problems in the DTEs' network utilities are endemic to infrastructure sectors everywhere and largely reflect issues that arise after privatization, especially when combined with unbundling. In fact, the asserted deficiencies of their regulatory systems are characteristic of the performance of economic regulation as we have observed it in the advanced industrial economies.

Both experience and economic logic suggest that the post-reform improvements in performance will be limited, and probably unsustainable in the long-run, unless accompanied by appropriate second-generation regulatory reforms. These include: (i) the design of end-user pricing policies that strike a satisfactory balance between economic efficiency and social equity; (iii) rules governing access to bottleneck infrastructural facilities—i.e. network components that are essential for the provision of final services and too costly to duplicate; and (iii) alternative ways of promoting access to service for the poor.

Pricing Reform—Balancing Efficiency with Social Equity

Successful privatization and restructuring programs require pricing policies that provide signals and incentives for efficiency by consumers, suppliers and investors. However, the prevailing pricing structures in many DTEs continue to conflict with the dictates of economic efficiency [World Bank (WDR) 1994]. In most of these countries, old-style centralized price setting is still conducted by ministries with a mandate to establish price controls to serve macroeconomic objectives (Bruce et al 1999). Thus, the real challenge facing the DTEs is not merely their ability to adopt privatization timetables and establish regulatory institutions, but rather to put in place effective price rebalancing and price regulation for the future.

Some of the observed deviation from optimal policy can be attributed to political and social constraints—noneconomic and equity considerations inevitably intrude into the process of devising and administering economically efficient pricing structures (Kahn 1988, Dinar 2000). Indeed, inefficient pricing rules are frequently the consequence and instrument of a complex system of cross-subsidies within the broad domain of social policy. But, the observed deviations from optimal pricing are also due to a genuine lack of appreciation of the power of alternative pricing schemes

that could strike a more satisfactory balance between economic efficiency and social equity. In particular, price differentiation and competitive pricing flexibility, potentially very valuable tools in efforts to achieve revenue adequacy and expand service to the poor, have not been sufficiently exploited in the DTEs.

Policy solutions that are consistent with both economic efficiency and social equity are not always available or politically feasible. Pricing reform is one of the most challenging tasks confronting policymakers in the DTEs (Argentina 1996, Hungary 2000, Romania 2000, Mexico 2001). It is also an area of policy where: (i) the uncritical replication of approaches developed in advanced industrial economies is likely to prove most problematic for the DTEs, and (ii) the technical assistance offered by multilateral organizations and other external advisors has been the least satisfactory.

There is an urgent need for applied policy research to identify next-best pricing policies that provide the requisite incentives for efficiency by consumers, suppliers and investors while serving the community's conception of justice. As a first step, the potential use of differentiated, non-linear, and other pricing schemes to ease the transition to cost-reflective and competitive pricing in the infrastructure sectors of DTEs should be examined. In these countries' current situations, the policy emphasis should not be on "optimal" tariffs but rather on tariff reform—to find feasible directions of change in tariff structures which achieve some combination of welfare increase and revenue adequacy (Armstrong and Rees 2000). However, changes in the rate structures should not be so precipitous as to cause severe economic dislocations. Thus, policymakers in these countries need to plan early on for a smooth transition to cost-reflective prices. That is the only way to avoid serious dislocations for their national industries and their customers (Monson and Rohlfs 1993). Otherwise, consumers without viable alternatives—notably the poor—will suffer the most.

Pricing Issues in the DTEs

The pricing issues facing policy makers in the DTEs are unique in several respects.

Revenue Inadequacy

Inefficient pricing policies have been one of the most important causes for the secular deterioration in the performance of the infrastructure sectors in the DTEs prior to the reform era (e.g. Brazil 1992, 1994). These countries, unfortunately, were in even less of a position to afford

the costs of resource misallocation and inefficiency in production than their developed counterparts. Price controls were imposed without regard to their performance implications, subjecting the operating entities to considerable financial distress and substantially impairing their ability to maintain and expand service, especially in poor and rural areas. The failure of many governments to prescribe adequate rate increases, especially during periods of high inflation, effectively decapitalized their infrastructure sectors. As a result, quality of service suffered. Moreover, the inability of financially impaired infrastructure industries to respond sufficiently to the increasing demands of modernized economies for better and more varied services constrained domestic growth and hampered international competitiveness. This problem was particularly pronounced in the telecommunications sector, but also serious in electricity and transportation.

Unsustainable Social Pricing Schemes

On the demand side, many of the infrastructure services tend to be extremely price and income inelastic. Thus, their pricing has important distributional implications. Subsidizing basic services, such as electricity and water, appears politically attractive as it can approximate a lump-sum grant, targeted in proportion to the number of household members. Conversely, raising the price of basic infrastructural services appears like a lump-sum tax bearing heavily on the poor, elderly, and those with large families (Newbery 1999). Not surprisingly, the movement towards cost-reflective tariffs frequently encounters strong political obstacles.

Past policies in the infrastructure sectors have therefore led to prices with systematic cross-subsidization [Kahn 1984, World Bank(WDR)]. The publicly articulated rationale is that such policies foster desirable social goals (helping certain classes of customers who would otherwise be disadvantaged) and positive economic externalities associated with universal service. In practice, however, a substantial portion of the benefits frequently flowed to those outside of the intended target group.[38] The lack of policy attention to tight targeting led to significant distortions in usage and investment decisions.

[38] As documented by the World Bank's 1994 World Development Report: Infrastructure for Development, major beneficiaries of these subsidy programs are the higher income groups since they are the large consumers of infrastructure services. Moreover, the resulting revenue inadequacy inhibits the extension of services to poorer groups of consumers, for example those in rural areas. This is particularly true in the water and electricity sectors.

Both economic theory and regulatory experience suggest that it is impossible to maintain significant cross-subsidies in the structure of prices for long, with open entry and no remedial policies, whether or not that would seem to be desirable (Box 6.1).

Box 6.1 Picking apart cross-subsidies

To use this term rigorously, a customer service that is priced above its *stand-alone* cost provides a cross-subsidy to another customer service that is priced below its *incremental cost*.[39] Economic logic teaches that prices with cross-subsidies are unsustainable in an environment of open entry, and that such competition predictably leads to inefficiencies. The reason is simple—entrants will be impelled by the profit motive to divert the overpriced business, regardless of these entrants' efficiency, while entrants are unlikely to relieve the incumbent service provider from the financial burden of serving customers whose prices do not compensate the costs required to serve them (Willig, 1994). Thus, even suppliers with inefficiently high costs may find entry profitable in reaction to pricing that has the mandate of providing a flow of cross subsidies. Entry of this kind not only raises industry costs, but it also erodes the very ability to finance the subsidies that motivate the policy.

The other side of the cross-subsidization coin is the set of prices that lie below their services' incremental costs. While these prices convey the subsidies that motivate the policy, they also discourage the competitive entry of alternative suppliers who would contribute to industry efficiency. An entrant might have incremental costs of providing services that are lower than the incremental costs of the incumbent service provider, but are greater than the level of the cross-subsidized prices. Such a supplier might enter and enhance consumer welfare in an undistorted competitive environment, and yet find it financially unrewarding to enter in the face of cross subsidies.

Source: Willig (1994).

Policymakers in the DTEs therefore suffer from an apparently irreconcilable dilemma. Social development goals and political pressures have led them to design infrastructure pricing with significant cross-subsidies. At the same in recent years, these policymakers have sought to competitively restructure, liberalize and privatize their infrastructure sectors. These two goals are ordinarily incompatible (Baumol, 1999). Competitive entry will destroy the cross-subsidy.

Since the network utilities play such a critical role in the economy it is imperative that the removal of pricing distortions in these sectors be a key component of any economic reform program in the DTEs. However, there are good reasons to avoid too abrupt price changes, which can cause large and unnecessary adjustment costs to consumers and firms alike. Even optimal prices, if instituted extremely rapidly and without sufficient notice, can lead to a transition process that is damaging and costly, and hence far from optimal (Baumol 1995). This is a point that has been unfortunately ignored in some privatization and restructuring programs,

[39] The stand-alone cost of service is defined as the cost (including a competitive return to capital) that would be incurred by an efficient entrant if it were to undertake to provide that service alone, or if it were instead to provide that service in combination with some other services of the enterprise whose regulation is at issue. The incremental cost of a service or a collection of services is the added cost to the system of providing them, given all other system activities.

thereby creating public disenchantment with the reform process and a real danger of policy reversal. This does not, of course, argue for mere postponement but rather for a deliberate transition.

Potential Solutions: Competitive Pricing Flexibility

With the progressive introduction of competition and privatization, rebalancing of prices (change in both levels and structure of tariff schemes) for different basic infrastructural services becomes necessary—both for the operating entities' sake, and for the public interest. However, radical, across-the-board realignment of prices with underlying costs may impose serious hardship for the poor. The question is how to achieve the important objective of revenue adequacy while affording adequate protection to certain disadvantaged groups. To resolve issues and questions of this kind, economics offers pertinent and well-established principles and insights that flow from both theory and regulatory experience around the world.

Constraints of price uniformity or regulatory mandates that disallow price differentiation can seriously undermine revenue adequacy, by limiting the ability of infrastructure operators to efficiently exploit the characteristics of demand and extract more revenue from high valuation customers. As an alternative, using nonlinear prices can be particularly useful by alleviating the need for radical tariff rebalancing. The infrastructure entities must be permitted to compete with flexibility of prices and terms, in order for the economy to receive the benefits of market liberalization that motivate pro-competitive policy in the first instance. In order to cover their fixed costs, sunk costs, costs of various obligations, and the revenue requirements promised by the privatization agreements, prices will best serve the public interests if they are permitted by regulation to vary among classes of users in accordance with value of service, as well as in response to the marginal costs of service. The need to set some prices aggressively low in order to retain the business means that other prices should be permitted to take up the slack in order to efficiently secure adequate revenues.

For example, in telecommunications, policymakers should permit the rapid installation of new access lines, wired or wireless, based on pricing that reflects differences in the value of service and is designed to clear backlogs. Also, consumers who place relatively high value on a service should

contribute relatively large net revenues to the coverage of unattributable, fixed and common costs. By offering discounts with non-linear prices to non-captive customers, the utility will be able to recover the costs of the local loop with marginal access prices much closer to incremental cost and keep all customers in the network, to the benefit of all.

A Practical Pricing Regime—"Constrained Market Pricing"

The data requirement is the prime regulatory dilemma besetting the pursuit of pricing rules that can elicit economic efficiency. The informational problems are likely to be especially severe in the DTEs, where the auditing technologies are weak and regulatory bodies lack the proper technical expertise (Beato and Laffont 2002). In particular, information on current demand elasticities and other pertinent attributes of the demand relationships are virtually unobtainable in practice.

There is promising solution to this dilemma that has been successfully adopted in some countries (ICC, 1985)—*constrained market pricing*. It divides the setting of final product prices into two stages. The first stage consists of the regulator imposing floor-ceiling constraints upon the setting of prices by the regulated firm. Such constraints can fortunately be expressed in the required quantitative terms with the aid of cost information alone. The second part of the price-determination process is then left to the firm, whose self-interest will lead it to take demand conditions into account. The regulated firm is prohibited from selecting any prices that violate the cost-based constraints adopted by the regulator; but within those limits the firm is granted the freedom to select the prices that best promote its interest.

The regulated price ceiling and floor for each product are derived from the competitive-market model. Thus, the firm is never permitted to adopt a price that exceeds the amount at which an efficient entrant-rival could afford to supply the product in a competitive market in which inputs are available on competitive terms--this price ceiling is called the "stand-alone cost" of the product or service in question. (Recall Box 6.1) A price constrained not to exceed the stand-alone cost ensures that purchasers will pay no more for this item than they would have if it were sold in an effectively competitive (contestable) market. The price floors reflect the product's marginal or average incremental cost. This approach, in essence, seeks to enforce competitive behavior in

arenas where such behavior is not the automatic result of market conditions (Baumol and Willig, 1988).

The primary purpose of the stand-alone cost ceiling, aside from its role in eliciting economic efficiency, is to protect consumers from monopolistic exploitation through the imposition of excessive prices by the regulated firm. Similarly, the primary purpose of the price floors, economic efficiency aside, is to protect actual or prospective rivals of the regulated firm from predatory pricing and related practices that can seriously handicap these competitors or drive them from the field altogether.

The application of differentiated pricing rules in the DTEs, when it has been considered at all, has often been dismissed as too difficult to implement and contrary to social equity. However, it is possible, and indeed imperative, that such pricing approaches be made practicable in the context of infrastructure sectors that have been facing chronic problems of revenue inadequacy, underinvestment, and low coverage ratios. These rules should be viewed as a source of qualitative guidance rather than æs generators of precise and definitive prescriptions for pricing. In many instances, price differentiation may have much more profound implications for revenue adequacy than the orthodox uniform price rebalancing schemes (e.g., across-the board price rises), and provide greater potential for social equity than the unsustainable internal cross-subsidies under price uniformity.

The Next Steps

The priority for action, involving both applied research and detailed policy analysis, is to adapt a set of practical, flexible, differentiated pricing rules for infrastructure services that strike a proper balance between economic efficiency and social equity. This agenda will also entail developing a systematic cross-country database on infrastructure pricing and regulatory determinations that will permit emerging regulatory entities to utilize world cost and other relevant benchmarks. Reform programs in several countries have been criticized as excessively and unjustifiably increasing prices and hurting the poor, yet reform remains essential to achieve developmental objectives (including poverty reduction) in a sustainable manner. Pricing is an area of policy where practical research is needed to aid in the real-time design and application of improved—second best, but workable—pricing reforms. This applied research would draw on the theoretical insights of the literature on competitive pricing flexibility and non-linear pricing rules, to design transitional approaches that

permit applying cost-reflective prices in the restructured and privatized network utilities, taking account of regulatory and informational constraints and perceptions of social fairness.

Facilitating Access to Bottleneck Facilities

Restructuring of utilities requires policy makers in the DTEs to address a difficult new issue. As a part of restructuring, potential competitors will often require access to essential (bottleneck) network facilities. Thus, the removal of legal barriers to competitive entry is not sufficient by itself to install a regime of effectively functioning competition in the infrastructure sectors. Competitors must have access to these bottleneck facilities on non-discriminatory terms if they are to have a reasonable opportunity to compete. If competition is to flourish, it may require explicit regulatory intervention to ensure such access, particularly in situations where those essential facilities are themselves controlled by the incumbent infrastructure operators, who will in many settings have ordinary business incentives to deny rivals fair access.

The Issue

The emerging experience from several countries reveals that the allocation of bottleneck infrastructure facilities and the broad issues of access and interconnection are of critical importance in the deregulation and competitive restructuring of the infrastructure sectors. In the telecommunications industry, the bottleneck is access to the local loop by suppliers of long-distance services; in electricity, rival generators must have access to transmission facilities; in the gas sector, producers require access to transmission pipelines; in railroads, the provision of services is dependent on access to the track. Still, the regulators face the enormously important task of identifying the appropriate terms and scope of compelled sharing of such essential facilities. The benefits of liberalizing the potentially competitive segments of these industries will not obtain unless a proper access and interconnection framework is put in place (Armstrong and Doyle 1995, Valetti and Estache 1998, Kessides et al 1999).

The design of appropriate access and interconnection pricing rules has become one of the central and perhaps most complex and controversial regulatory tasks in the network utilities. This task is even more daunting in the DTEs because of severe measurement problems with respect to the relevant economic variables and the lack of the requisite technical expertise.

One of the primary challenges facing regulators in the DTEs is to ensure access of competitors to bottleneck facilities on terms that are consistent with efficient competition--i.e., to set a level and structure of access prices which promote dynamic efficiency through entry and investment decisions, while enabling the owner of the respective network to remain financially solvent. Thus, prices should be sufficiently high to be compensatory (at least cover the long-run incremental cost of the use of the network by the entrant), yet not so high as to preclude efficient operations by the entrant.

The access problem is especially vexing in situations where competitors require a bottleneck input controlled by one of their rivals. Monopoly control of bottleneck facilities can create irresistible incentives to behave anti-competitively and cross-subsidize unregulated competitive activities from regulated monopoly ones. Without regulatory constraint, the holder of the bottleneck monopoly could repress competition by creating artificial handicaps for its rivals in the market for the final products sold to consumers. The monopolist can impose costs on its competitors by impeding their access to the bottleneck, thereby raising the prices that they must charge to cover their elevated costs, and thus weakening their ability to compete.

Two Alternative Models

The economic literature offers two major approaches to the efficient pricing of bottleneck facilities: the Baumol-Willig efficient component pricing rule (ECPR), or parity pricing, and the Laffont-Tirole global price cap rule (Baumol et al 1997, Laffont and Tirole 1994, 1996). Efficient component pricing is the name that has been given to the principle that the holder of the bottleneck facility should offer its services at a price that yields it the same contribution that it would earn from performing the end-user service itself. ECPR is consistent with efficient competition--it ensures that the responsibility for supplying the contested services is distributed among actual and potential rivals in such a way as to minimize total costs. However, ECPR does not in itself permit competition to fulfill its other important functions of eliminating allocative inefficiency and eroding monopoly profits--the ultimate determination of how large a markup of the retail price above marginal cost is economically efficient, and therefore what level of contribution should correspondingly be incorporated in access charges, must be correctly supplied by regulation. This requirement is likely to be substantially violated in DTEs with deficient regulatory mechanisms where the regulatorily-imposed price structures are frequently inefficient.

The Laffont-Tirole rule recognizes the fact that the profit of the integrated incumbent is an increasing function of both the access charge and the final retail price. Under a break-even constraint, a higher access charge would permit the regulated firm to lower its final price. A regulator concerned with consumer welfare would take this trade off explicitly into account. The socially optimal level of the access charge will depend on the benefits of reducing the retail price (which will depend on the elasticity of demand) and the effects of raising the access charge on productive inefficiency (which will depend on the entrants' elasticity of supply).

However, despite their internal consistency and powerful theoretical results, the translation of either approaches into workable rules and actual access pricing schedules for the guidance of regulators and their accountants and engineers has been proven to be an extraordinarily difficult and contentious task. The first approach suffers from very restrictive assumptions that limit significantly its applied policy content. Indeed, the case for adopting ECPR is not so unequivocal when allocative and dynamic efficiency are important issues, as is likely to be the case in many DTEs--i.e. when even inefficient competition could make a substantial contribution to allocative efficiency and to stimulating improvements in efficiency and service innovation (Kahn and Taylor 1994). The Laffont-Tirole rule has substantial informational requirements (demand and supply elasticities are generally very difficult to estimate in practice). Thus, its translation into operational rules than can be applied in real world settings is challenging.

The Next Steps

An important priority for public policy in the restructured utilities of the DTEs is to develop a regulatory architecture for network access that has realistic prospects of being effectively implemented . There is an urgent need to translate the principles and results of the theoretical and analytic work on access into a set of tractable and workable rules and procedures, especially in the face of severe measurement problems with respect to the relevant economic variables. One promising direction for applied policy analysis is to build on the powerful insights of ECPR and the Laffont-Tirole price cap rule, and to develop a hybrid model that combines the two approaches with the objective of promoting productive and allocative efficiency. Moreover, in the context of the DTEs, it is imperative to identify the conditions, if any, under which it is appropriate to use access pricing as an instrument for the promotion of supplementary goals (e.g. expanding service to the poor) that go beyond the attainment of economic efficiency.

Promoting Access to the Poor

In the past few years, there have been increasing concerns expressed about the impacts of privatization and market liberalization policies in the DTEs on low-income households. (Estache, Foster, and Wodon 2002). In particular, some worried that competition would make the traditional method of financing access for low-income households—cross subsidies from higher income customers--more difficult if not ultimately impossible. The fear was that new competitors entering the market would target only the most profitable customers, eroding the profits that incumbent enterprises had used to subsidize service to low-income groups and high-cost areas. Consequently, even if privatization and competition resulted in system expansion and lower average tariffs, it was thought that low-income households might end up paying higher prices and governments might need to find new sources for financing universal access—a very difficult task in the DTEs because of their inefficient and distortionary tax regimes.

The Issue

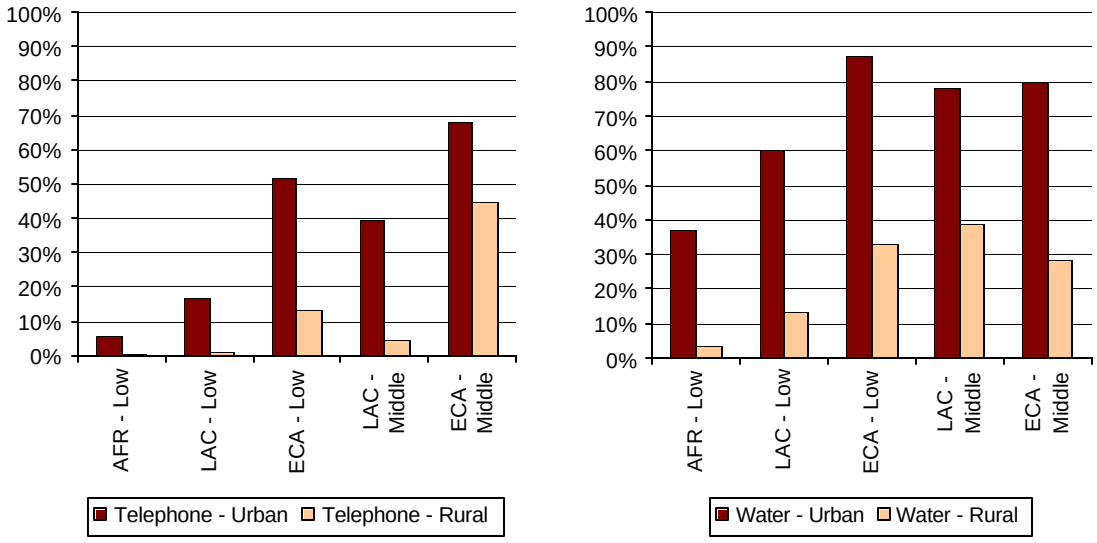
Although low coverage among low-income and rural households suggests that public monopolies have not successfully promoted access to infrastructure services among these groups in most developing countries (Figure 6.1), it is not clear that privatization and liberalization will automatically benefit these groups either. Although case-study evidence suggests that public monopolies have often been overstaffed, inefficient, and have lacked the resources needed for expanding service, tariffs have often been heavily subsidized from general government revenues and companies have often cross-subsidized certain consumers or services--although in practice it is unclear whether these have reached the poor. The impact that reform has on coverage will therefore depend upon how effectively it removes constraints on investment and how it impacts prices paid by low-income consumers.

The empirical evidence on the effects of reforms on the poor is limited, although case studies and data gleaned from household surveys suggest some important preliminary trends. First, there is little evidence that reforms consistently hurt poor or rural consumers in terms of access to service. (Clarke and Wallsten 2002) Even when service prices have increased for these households, the share of poor and rural residents with connections has often not fallen and in many cases has even increased. Further, case studies reveal that allowing competition in infrastructure services can dramatically improve service to the poor – competition can allow a range of price and quality

options, making service possible to regions and income levels that a monopoly provider would never have considered.

It is important to note, however, that the impacts of reform vary from country-to-country and city-to-city. In countries and cities where coverage is already very high among poor households, or where many poor consumers have informal or illegal connections, significant price increases and regularization of customer accounts might lead to a reduction in coverage among low-income households even if total coverage increases. In contrast, in countries where service was heavily rationed prior to reform, privatization and liberalization might result in increased coverage for low-income households, even if prices increase.

Figure 6.1 Infrastructure Access for Urban and Rural Areas in 1990s



Source: Clarke and Wallsten (2002).

The Next Steps

Existing research is suggestive, but rigorously evaluating access by the poor to infrastructure facilities is imperative for the design of pro-poor regulatory policies. There is little consistent data to support the design of such policies. There is an urgent need to obtain additional data on infrastructure services and low-income households. In particular, the demand side of infrastructure services and the poor needs to be analyzed more thoroughly--not only to what extent the poor are connected to infrastructure services provided by the large utilities, but also factors that

affect their decision to connect, the role of informal service providers, and how the presence of alternatives affects household connection.

Understanding willingness-to-pay and demand is critical to assessing the effects of reforms and ensuring access. For example, data constraints prevent existing policy analysis from determining whether households remain unconnected because they are not willing to pay for service in the presence of viable, perhaps informal, alternatives or whether those alternatives exist because households are unable to connect due to credit constraints or because the utility does not provide service in the area. Existing data from the DTEs do not allow policy analysts to distinguish between competing hypotheses for nonconnection. Knowing the reason is crucial for developing policy responses to enhance access and designing projects that will be effective in extending service to rural areas and to the poor.

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